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Two fundamental problems

The greatest problem which the statesmen of our time have to solve is the humanization of industry and labor. They must find means of protecting the lives and souls of men against the merciless development of industrial, commercial and financial methods, or rather those methods must be radically transformed in order to realize (or begin the realization of) a human economy as opposed to a purely material economy. The greatest treasures of any country are men, not goods. The problem is easier to state than to solve; its solution cannot be worked out completely on a national basis, for international difficulties are involved. Just as soon as our statesmen can be brought to see that the happiness of individual men, and their creative activities in the field of art and science are the main concern, and that on that basis the efforts of each nation are to the benefit of all others, just as soon as they see that, and no sooner, will it be possible to establish international peace on a sound foundation.

The greatest problem which educators all over the world have to solve is the humanization of science. They must find means of integrating science with the rest of our culture instead of allowing it to develop as an instrument alien to it. The best way to humanize science is to consider it historically, to study its genesis and evolution, and to explain that the scientific achievements of each age were human achievements, indeed were among the purest and most glorious achievements of that age. For can man do anything greater than to add a little increment of beauty, justice and truth to the patrimony bequeathed to him not by his own ancestors only, but by men of many nations, races and creeds?

It is noteworthy that *these two problems are correlative*; they

have both been entailed by the same cause—the fantastic progress of scientific knowledge and industrial applications. It is necessary to readapt the body politic and the minds of individual men to the new conditions which the development of science and of scientific method has created. The second problem is more particularly our own and let us devote ourselves to it humbly and patiently. As our knowledge and technique improve and become more complex and more dominating, we need more humanism, not less, but humanism including science, instead of being antagonistic to it or at best ignorant of it.

(Lisbon, September 27, 1934.)

GEORGE SARTON.

Studien zu Muhammad Ibn Umail al-Tamimi's Kitāb al-Mā' al-Waraqī wa'l-Ard an-Najmiyah

Als ich vor zehn Jahren die *Tabula Smaragdina* auf ihre Quellen zurückverfolgte, hätte ich auch die *Tabula Chemica* des SENIOR ZADITH FILIUS HAMUEL in den Kreis der Untersuchung einbeziehen können. Die Erzählung von der Entdeckung der Bilder beim Eindringen in die Räume eines altägyptischen Tempels, die der „*Epistola Solis ad Lunam crescentem*“ vorausgeschickt wird, ist ja auch nichts anderes als eine Abwandlung der alten HERMES-Legende. Wenn ich von der Behandlung der durch die *Tabula Chemica* aufgegebenen Fragen Abstand nahm, geschah es aus dem einfachen Grunde, dass mir die arabische Quelle dieses Traktats damals noch nicht bekannt war, und wenig damit erreicht gewesen wäre, wenn ich nur die leicht zugängliche Fundgeschichte und Bildbeschreibung wiederholt hätte.

Heute stehen wir durch die Veröffentlichung des arabischen Originaltextes, die den seit Jahren auf dieses Ziel gerichteten Bemühungen H. E. STAPLETONS zu danken ist, einer vollkommen geänderten Lage gegenüber (1). Wir haben endlich den authentischen Text der allegorischen Weisheit des IBN UMAIL und erfahren zum ersten Mal, in welchem entsetzlichen Zustand sich, gemessen am Original, der lateinische Text befindet. Dutzende von sinnlosen Stellen erweisen sich, wenn man das Arabische daneben hält, als Übersetzungsfehler, vor allem aber auch als reine Lesefehler oder Verschreibungen, deren Korrektur selbst dem scharfsinnigsten Philologen ohne den arabischen Text

(1) Three Arabic Treatises on Alchemy by MUHAMMAD IBN UMAIL (10th Century A.D.). Edition of the texts by M. TURĀB 'ALI, M. A. Excursus on the Writings and Date of IBN UMAIL with Edition of the Latin Rendering of the *Mā' al-Waraqī* by H. E. STAPLETON, I.E.S., and M. HIDĀYAT HUSAIN, Shams al-'Ulamā', Ph. D.—*Memoirs of the Asiatic Society of Bengal*, Vol. XII, No. 1, pp. 1-213. Calcutta, 1933.

unmöglich wäre. Zahllose kleinere Auslassungen mitten im Text zeigen, dass der Übersetzer häufig seiner Aufgabe nicht gewachsen war und Stellen, die er nicht verstand, übersprang oder nach Gutdünken deutete. Die grösste Überraschung für den Chemiehistoriker liegt aber in der Tatsache, dass der lateinische Text von den 90 Strophen der „*Epistola Solis ad Lunam crescentem*“ nur die ersten 53 enthält, dass die in den Kommentar eingeschalteten Gedichte sämtlich unterdrückt sind, und dass von dem Kommentar selbst nur die erste Hälfte des Textes übersetzt ist. So kann der lateinische Text nur mit starken Einschränkungen als eine Wiedergabe des Werks von IBN UMAIL bezeichnet werden, und man wird die Untersuchung des Einflusses dieses verstümmelten Textes auf die lateinischen Alchemisten grundsätzlich von der Untersuchung des Originaltextes und seiner Quellen trennen müssen.

Ich beginne meine Studien mit der Vorfabel und ihren bildlichen Darstellungen in den lateinischen Ausgaben, lasse dann Bemerkungen über den Zustand des lateinischen Textes folgen und schliesse mit Untersuchungen über die von IBN UMAIL benützten Quellen und die Bedeutung, die der allegorischen Richtung in der Gesamtentwicklung der Alchemie zukommt.

I. — *Die Vorfabel und ihre bildliche Darstellung*

Um eine sichere Grundlage für die Diskussion zu schaffen, muss ich die Übersetzung des arabischen Textes vorausschicken. Die Übersetzung ist so wörtlich wie möglich gehalten.

[1] Es sagt ABŪ 'ABDALLAH M. IBN UMAIL AL-TAMĪMĪ — möge Allah Wohlgefallen an ihm haben: Siehe, ich trat ein mit ABULQĀSĪM 'ABDARRAḤMĀN, dem Bruder des ABULFAḌL JA'FAR AN-NAHWĪ, und ein andermal trat ich ein mit ABULḤUSAIN 'ALĪ IBN AḤMAD IBN 'ABDALWĀḤĪD, bekannt unter dem Namen AL-'ADAWĪ, in Būṣīr, das Gefängnis JOSEPHS, das als Sidar Būṣīr (2) bekannt ist, und wir begaben uns in einen Tempel (3), den die Muṭālibiyyūn (4) geöffnet hatten.

(2) Būṣīr al-Sidar liegt zwischen Sakkarah und Gizeh, in der Nähe der grossen Pyramiden. *Enz. Isl.* I, 838.

(3) Das Wort *barbā'*, vom kopt. *p'erpe*, ist nur für die altägyptischen Tempel und Tempelruinen, nicht für die Pyramiden im Gebrauch. Vgl. DOZY, *Suppl.* I, 63; C. H. BECKER in *Enz. Isl.* I, 682.

(4) Nach STAPLETON „the keepers“. Ich kann einen Beleg für diese Bedeutung nicht auffinden und würde eher an Forscher oder an Schatzgräber denken.

[2] Da sah ich an der Decke seiner Vorhalle (5) das Bild von neun Adlern, die Flügel ausgebreitet, als ob sie flögen, die Fänge vorgestreckt und geöffnet, in den Fängen eines jeden Vogels etwas wie der breite, gespannte Bogen (6), den die Krieger in den Händen führen.

[3] Und an der Mauer der Vorhalle, auf ihren beiden Seiten rechts und links von dem, der den Tempel betritt, (sah ich) Bilder von stehenden Leuten, das Vollkommenste und Schönste, was es von Bildern gibt, bekleidet mit (Kleidern von) allerlei Farben, ihre Hände gegen das Innere des Tempels ausgestreckt, indem sie nach einem Steinbild hin zeigten, im Innern des Tempels sitzend, auf der Seite am Torpfeiler des Tempelraums (7), zur Linken dessen, der in den Tempelraum eintreten wollte, mit seinem Gesicht dem zugewendet, der von der Vorhalle aus zu ihm eintrat; und zwar auf einem Sitz (8) nach Art der Sitze der Ärzte, von dem Steinbild abstehend (9).

[4] Und in seinem Schoss auf seinen beiden Unterarmen, die beiden Hände ausgestreckt über seinen beiden Knien, (ruhte) eine Tafel, (ebenfalls) von ihm abstehend (10). Es war ihre Länge gleich der Grösse der Elle und ihre Breite eine Spanne, und die Finger der Hände des Steinbilds unter der Tafel waren um die Tafel gekrümmt, als ob dies sie festhielte. Und sie war ähnlich einem Buchband, für jeden, der eintrat, geöffnet, als ob es mit ihr dem Eintretenden zuwinken wollte: „Schau auf sie“! Und auf der Seite, wo das Steinbild sass — ich meine in der Halle (11) — befanden sich Bilder von vielerlei Dingen und Inschriften mit dem Tempelschreibrohr (12).

[5] Und die Tafel (13) auf dem Schoss des Steinbilds war durch eine Linie in ihrer Mitte in zwei Hälften geteilt. Auf ihrer einen Hälfte (befand sich) das Bild von zwei Vögeln, in ihrem unteren Teile, nämlich dem, der seinem Schoss benachbart war (14); und dem einen von beiden waren beide Flügel

(5) STAPLETON: „on the roof of the galleries“. Das Wort *saqf* ist besser mit „Decke“ oder „Plafond“ zu übersetzen, das persische *dihliz* bedeutet von Haus aus ein grosses Zelt oder dessen Vorhalle, in der der Sultan Recht zu sprechen pflegte, dann jede andere grosse Halle.

(6) STAPLETON: „a thing like the fully-drawn bow“; in der Übersetzung „similitudo arcus ampli“. Das Wort Bogen fehlt im arab. Text.

(7) Das Wort *majlis*, wörtlich „der Ort, wo man sitzt“, bedeutet jeden grösseren Saal, besonders einen Gerichtshof, auch einen Vorlesungssaal, hier natürlich den Hauptraum des Tempels.

(8) Der Ausdruck *kursiyy* ist ziemlich vieldeutig: Thron, Katheder, Predigtstuhl usw.

(9) STAPLETON: „The chair being separate from the figure“; lat. Übersetzung „sub cathedram extractam a statua illa“. Der Ausdruck kehrt nachher wieder und ist mir nicht ganz verständlich.

(10) Das Wort *balāta* bedeutet gewöhnlich die breiten, quadratischen Backsteine, die zur Pflasterung von Höfen und Fussböden verwendet werden. Gebräuchlicher ist in unserm Falle das Wort *lauḥ*; vgl. J. RUSKA, *Tabula Smaragdina* S. 1, Anm. 1.

(11) Hier ist im Text das Wort *riwāq* benützt, das Vorhang, Gallerie, Säulenhalle und Saal bedeuten kann.

(12) STAPLETON: „inscriptions in hieroglyphic writing“.

(13) Das *fī* vor *al-balāta* ist zu tilgen.

(14) Der Text *mimmā yalī ṣadrahu* wird vom lateinischen Übersetzer mit „pectore inclinato“, von STAPLETON mit „having their breasts (contiguous)

abgeschnitten, der andere besass beide Flügel, und jeder der beiden Vögel fasste mit seinem Schnabel den Schwanz des anderen, ihn packend, als ob der (geflügelte) Vogel mit dem Verstümmelten wegfliegen, der Verstümmelte aber den anderen zu sich herabziehen wollte. So bildeten die beiden Vögel einen einzigen Kreis, das Bild von Zwei in Einem. Und am Kopf des Fliegenden von den beiden war ein Kreis, und oberhalb dieser beiden Vögel am Kopf der Tafel, benachbart den Fingern des Steinbilds, das Bild des wachsenden Monds, und an der Seite des wachsenden Monds ein Kreis, ähnlich dem Kreis unterhalb der beiden Vögel. So waren es im ganzen fünf: drei unten, nämlich die zwei Vögel und der Kreis, und über ihnen das Bild des wachsenden Monds und der andere Kreis.

[6] Und auf der anderen Hälfte, am Kopf der Tafel, den Fingern der Hand benachbart (befand sich) das Bild einer Sonne mit zwei Strahlen, als ob sie das Bild von Zwei in Einem wäre, und ihnen zur Seite eine andere Sonne mit einem einzigen absteigenden Strahl. Dies sind also drei Dinge, ich meine drei Lichter; und der Strahl von Zwei in Einem und der Strahl des Einen, herabsteigend, gegen den unteren Teil der Tafel herabgezogen, sie umfassen — ich meine die Strahlen — einen schwarzen Kreis, zu einem Drittel geteilt, so dass ein Drittel und zwei Drittel entstehen. Das (innere) Drittel entspricht dem Bild des wachsenden Mondes, weil das Innere weiss ist, ohne mit Schwarz angefüllt zu sein, und der schwarze Kreis umgibt ihn, weil sein Bild das Bild von Zwei in Einem ist, und was darunter ist, ist Eins von Zweien. Und beide, der schwarze Kreis und der wachsende Mond, den der Kreis umgibt, weil sein Bild Zwei in Einem ist, und die beiden oberen Sonnen, ich meine das Bild von Zwei in Einem und die einzelne Sonne, also das Bild von Eins in Einem — diese also sind ebenfalls fünf Dinge, und so kommt das Ganze auf zehn Dinge, nach der Zahl dieser Adler und der schwarzen Erde (15).

Der Abschnitt [1] ist in der gedruckten Übersetzung auf die sinnlosen Zeilen zusammengezogen: „Intravi ego et Oboël, charissima barba, in domum quandam subterraneam, et postea intui ego et Elhasam universos carceres Joseph ignitos“. Man erkennt in OBOËL noch einen Rest von ABULQĀSIM, in ELHASAM einen Rest von ABULHUSAIN, aber wenn man auch begreift, dass der Übersetzer sich nicht an die weiteren Namen kehrte, so steht man doch ratlos vor dem, was aus dem übrigen Text geworden ist. Wieviel davon mag der Schuld der Abschreiber und des Herausgebers, wieviel der Unzulänglichkeit des Übersetzers zuzuschreiben sein?

Schon STAPLETON hat das Wort *charissima* nach OBOËL als Verschreibung des Namens [ABUL]QĀSIM erkannt. Sie ist dadurch zustande gekommen, dass ein Abschreiber die Buchstaben *chsim*

to one another“ wiedergegeben. Es liegt offenbar schon im Arabischen eine Verschreibung für *hijrah* vor.

(15) An späterer Stelle heisst es: „et decima est faex“. Auf den Titelbildern zu den gedruckten lateinischen Ausgaben sind zehn Adler gezeichnet.

mit dem bekannten Zeichen für *a*, *ra*, *re*, *ri* nicht als arabisches Wort erkannte, sondern als „*charissima*“ deutete und zu „*barba*“ zog. Auch das Wort „*barba*“ ist nicht lateinisch, sondern Umschrift des ar. *barbā*, das der Übersetzer durch den Zusatz „in domum quandam subterraneam“ erklärt. Statt „intui“ ist „intravi“ zu lesen; auch hier ist das Zeichen für *ra* über dem *ui* der Handschrift übersehen oder vergessen worden. „Ignitos“ ist offenbar Schreibfehler für „cognitos“. Ob „universos“ aus *Sidar* zu erklären ist, wie STAPLETON vorschlägt, ist mir zweifelhaft, da es im Satze doch dem ersten Wort *Būṣīr* entsprechen müsste. Vielleicht hat schon die arabische Vorlage hier *fī jamī* gelesen.

Nicht so viele Einwendungen sind gegen die Beschreibung der Räume und der Wandbilder zu machen. Es ist verzeihlich, dass der Übersetzer die ihm mangels aller Erfahrung und Anschauung unklaren Bezeichnungen *barbā*, *dihlīz*, *majlis* und *riwāq* ziemlich willkürlich durch „domus“ und „thalamus“ ersetzte, und man begreift, dass die hieroglyphischen Tempelinschriften — *khuṭūṭ bil-qalam al-birbāwī* — sich in „litterae de Barbaria“ verwandelten. Schwieriger wird die Sache erst wieder bei der Beschreibung der auf der Tafel stehenden Figuren. Hier enthält schon der arabische Text Unklarheiten und Widersprüche. In der Einleitung zu [4] wird gesagt, dass die Arme der Statue auf dem Schoss liegen und die gebogenen Finger die Tafel von unten her halten; nachher aber, bei der Erwähnung des oberhalb der beiden Vögel gezeichneten Mondes, soll sich dieser dicht bei den Fingern der Statue befinden, und auch die auf der anderen Seite am oberen Rand gezeichneten Sonnen sollen den Fingern der Hand benachbart sein. Dasselbe wird auch in der Übersetzung mit den Worten „supra has duas aves iuxta caput tabulae proxime digitis statuae imago Luna lucentis (lies: crescentis)“ gesagt. Statt „respiens ad aves inferius“ müsste es „similis sphaerae infra aves“ heißen — hier hat der Übersetzer *naṣīra* mit *nāzīra* verwechselt. Die Zusammenfassung der fünf Bilder in dem Satz „erant autem universa tempora quinque, inferius videlicet aves duae, scilicet imago Lunae, et alia sphaera“ ist vollkommen verunglückt und müsste nach dem Arabischen „erant autem universa quinque, tres inferiores, sc. duae aves et sphaera, et super eas imago Lunae et alia sphaera“ heißen. Auf andere Unklarheiten will ich nicht weiter eingehen.

In den arabischen Handschriften sind, wie IBN UMAIL selbst ankündigt, die Zeichnungen der Tafel mit ihren allegorischen Figuren dem Text der „Epistola Solis ad Lunam crescentem“

SENIOR PHILOSOPHVS.

*Quid Soles, Lunæ signent, pictæ ue tabellæ,
 Quid uenerandi etiam, proflua herba, Senis.
 Turba quid astantum, uolucrum quid turba uolantū,
 Antra quid, armati quid pedes usq; uolent.
 Miraris? Veterum sunt hæc monumenta Sopborum,
 Omnia consignans, iste Libellus habet.*



eingeschaltet. Die Reproduktionen nach den von TURĀB 'ALĪ benützten Handschriften zeigen äusserst rohe Zeichnungen mit Inschriften, die mehr oder weniger ausführlich auf die symbolische Bedeutung der Figuren hinweisen. Nachzeichnungen ähnlicher Art sind auch in den lateinischen Handschriften vorauszusetzen, zu künstlerischer Darstellung hat aber erst die Drucklegung der Übersetzung Anlass gegeben. Ich gebe obenstehend die Darstellung wieder, die der ältesten, ohne Angabe von Drucker und

Jahr erschienenen Ausgabe vorangesetzt ist und allen späteren Gestaltungen der dargestellten Szene als Vorlage gedient hat. Die Figuren auf der Tafel entsprechen der Beschreibung, insbe-

DE CHEMIA
 Senioris antiquis
 SIMI PHILOSOPHI.
 LIBELLVS, VT BREVIS,
ita artem discentibus, & exercenti-
bus, utilissimus, & uerè
aureus.

DIXIT SENIOR ZADITH
 Filius Hamuel.



TN TRAVI EGO ET
 Oboël charissima barba, in
 domum quãdam subter-
 raneam, et postea intui ego
 & Elhasam uniuersos car-
 ceres Ioseph ignitos, & uidi in tecto
 imagines nouem aquillarum pictas, ha-
 bentes alas expansas, ac si uolarent, pe-
 des uero extentos & apertos, & in pes-
 de uniuscuiusq; aquilæ, similitudo ars-
 cus ampli, quam solent ferre sagittarij.
 Et in pariete domus à dextris & à sinis
 A ij stris

sondere sind die Sonnen mit einem und zwei Strahlen auf der rechten Tafelhälfte deutlich zu erkennen. Die Hände der Statue befinden sich an den unteren Ecken der Tafel, wie es am Anfang des Textes beschrieben ist. Die Darstellung des Raumes mit seinen Figuren ist aber insofern ganz frei behandelt, als die Männer und die Adler nicht als Wand- und Deckenbilder wiedergegeben sind, sondern körperlich zu beiden Seiten der Statue stehen bzw. in einem Bogen um den Kopf der Statue schweben. Eine andere

Lösung war nicht möglich, wenn der Künstler die Gestalten auf dem schmalen Raum einer Oktavseite unterbringen wollte. Auch der Raum, der die Gestalten umschliesst, musste der Bildfläche angepasst werden und entspricht in keiner Weise der Beschreibung im Text. Dort haben wir eine Vorhalle, aus der ein Tor nach hinten in einen Saal Einblick gewährt, und die Statue sitzt am Torpfeiler der linken Seite. Auf dem Bild ist die Vorhalle ein schmales und hohes Gelass, das hinten durch eine Wand mit zwei Bogenfenstern abgeschlossen ist, und die Statue füllt den ganzen Mittelraum aus.

Die den *Philosophiae Chymicae IV. Vetustissima Scripta*, Frankfurt 1605, vorangesetzte Abbildung ist eine schlechte Nachzeichnung der eben beschriebenen ältesten Darstellung. Das im *Theatrum Chemicum* vorangesetzte Bild, das STAPLETON a.a.O. S. 146 wiedergegeben hat, ist eine Bearbeitung der alten Vorlage, die sich aus der Aufgabe ergab, ein wesentlich höheres Rechteck in geeigneter Weise auszufüllen. Während die Statue im älteren Bild mit den Füßen den unteren Rand des Rechtecks berührt, sitzt sie jetzt im Hintergrund eines langen und hohen, mit quadratischen Fliesen belegten Ganges. Auch das Dach ist entsprechend verlängert, und an die Stelle der wenigen Nebenfiguren ist zu beiden Seiten ein wahres Gewimmel von Menschen, eine richtige „Turba Philosophorum“ getreten. Wesentlich verschlechtert ist die Wiedergabe der Tafelfiguren, insbesondere fehlen rechts die scharfen Abgrenzungen der Kreisringe und die Zeichnungen der Sonnenstrahlen.

Eine dritte Darstellung, die sich in MANGETS *Bibliotheca Chemica*, II, Taf. II, gegenüber S. 216 befindet, ist eine ganz minderwertige Nachbildung des eben beschriebenen Bildes. So kann man verfolgen, wie sich im Laufe der Zeit die Titelbilder immer weiter vom Text entfernen und ihrem ursprünglichen Zweck entfremdet werden.

Fragen wir nun, welche Tatsachen dem Text zu Grunde liegen können. Kann IBN UMAIL die Gefängnisse des JOSEPH in Sidar Būṣīr besucht haben? Gibt es Vorhallen und Säle im Innern der Tempel? Gibt es dort Statuen, die Tafeln mit symbolischen, auf Alchemie bezüglichen Figuren auf den Knien halten?

Von Gefängnissen des JOSEPH ist, soviel ich weiss, aus anderen

Quellen nichts bekannt, und wenn dieser Name zur Zeit des Verfassers an irgend einem Tempel oder Ruinenfeld gehaftet haben sollte, ist das sachlich ohne Bedeutung. Aber dass ein ägyptischer Gelehrter und Schriftsteller wie IBN UMAIL sich für die Tempel und ihre Bilder interessierte, liegt um so näher, als man hier die Sitze uralter Weisheit und insbesondere die Werkstätten der Alchemisten zu finden glaubte (16). So kann die Schilderung der buntgekleideten Gestalten an den Wänden der Vorhalle und die Beschreibung der sitzenden Statue sehr wohl auf eigener Anschauung beruhen — aber Tafeln mit den von IBN UMAIL beschriebenen alchemistischen Symbolen gab und gibt es nicht in ägyptischen Tempeln, und so ist die ganze Vorfabel doch eben nichts weiter als eine freie Erfindung, die die Voraussetzungen für das Lehrgedicht zu schaffen bestimmt war.

Die wichtigste Gestalt der Vorfabel ist die sitzende Statue mit der Figurentafel. Ihr Urbild ist die Gestalt des HERMES, der schon im *Buch des Krates* als ehrwürdiger Greis, in weissen Gewändern auf einem Thronessel sitzend, mit einer leuchtenden Tafel in den Händen, beschrieben wird. Merkwürdigerweise scheint IBN UMAIL nicht zu wissen, oder nicht wissen zu wollen, dass seine Statue den HERMES selbst darstellt. Er gibt an, dass ein Weiser den Tempel gebaut und das Steinbild mit der Tafel in den Tempel gesetzt habe, um dadurch seine geheime Wissenschaft auf die Nachwelt zu bringen (17), und legt das in der Einleitung zum Kommentar noch genauer fest, indem er sagt, dass die beschriebenen Figuren auf der Tafel im Schoss des Weisen in dem Tempel, den er für sich selbst gebaut hatte, aufgezeichnet gewesen seien (18).

Welche Gründe IBN UMAIL gehabt haben mag, von der allgemeinen Überlieferung abzuweichen, lässt sich nicht entscheiden. Wir werden sehen, dass der Kommentar an zahlreichen Stellen auf die *Tabula Smaragdina* und andere angebliche Schriften des

(16) Vgl. J. RUSKA, *Tabula Smaragdina* S. 63. 64. H. E. STAPLETON, *Memoirs* XII, a. a. O. S. 121, 122.

(17) Arabischer Text S. 3, Z. 1 v.o.; Übersetzung *Th. Chem.* V, 1660, S. 148 : „quae celavit ille sapiens, qui fecit statuam illam in domo illa, in qua descripsit totam illam scientiam quasi in figura sua, et docuit sapientiam suam in lapide suo, et manifestavit eam intelligentibus“.

(18) Übersetzung S. 154 : „in domo quam sibi aedificaverat“.

HERMES Bezug nimmt. Vielleicht hat dieser Umstand dazu beigetragen, dass IBN UMAIL den Tempel und das Steinbild nicht unmittelbar und unzweideutig auf HERMES bezog. Wenn dieser die Geheimnisse der Alchemie schon in so vielen Büchern und Schriften enthüllt hatte, brauchte er nicht auch noch Tafeln mit symbolischen Bildern zu benützen, um sein Wissen der Nachwelt zu verkünden. So bleibt es dem Leser freigestellt, welche Persönlichkeit er sich unter dem „Weisen“ vorstellen will.

II. — Die Überlieferung des lateinischen Textes

Die älteste mir bekannte Notiz, die eine Übersetzung von Werken des IBN UMAIL betrifft, ist in dem berühmten Pergamentcodex der Familie SPECIALE enthalten, der sich heute im Besitz der Biblioteca Comunale von Palermo befindet. Hier wird unter den Werken, die der Bibliothek des Klosters des heiligen PROCUL in Bologna gehörten,¹ neben der *Epistola Solis ad Lunam crescentem* auch ein *Liber Senioris Sahid filii Amili* erwähnt (19), und man wird kaum fehlgehen, wenn man in diesem Buch den Kommentar zur *Epistola* sieht. Bedauerlicherweise hat der Schreiber des Codex dieses Werk nicht unter seine Abschriften aufgenommen; wir hätten sonst sicher einen Text zur Verfügung, der in vielen Punkten zuverlässiger wäre als die Druckausgaben. So ist man für Vergleiche mit diesen auf die jüngeren Handschriften angewiesen, die Frau D. W. SINGER in ihrem *Catalogue* aus englischen Bibliotheken beschrieben hat. Die Zusammenstellung der Textanfänge (20) zeigt ohne weiteres, dass allen Handschriften der gleiche Urtext zugrundeliegt. Wenn also auch manche kleineren Fehler der Drucke sich durch eine Kollation der Handschriften verbessern liessen, so würde für die Beseitigung der grossen Lücken und Mängel des gedruckten Textes doch kaum etwas Wesentliches

(19) ISIDORO CARINI, *Sulle scienze occulte nel medio evo, e sopra un codice de la famiglia SPECIALE. Rivista Sicula VII, 1872, S. 178.*

(20) D. W. SINGER, *Catalogue of Latin and Vernacular Alchemical Manuscripts, Vol. I, S. 122, N. 136:*

(a) Dixit senior Caled filius Hahmil: Intravi ego et Obcelkasam Barbam id est domum quandam subterraneam...

(b) Dixit Senior i. s. Plato Saky filius Hamil: Intravi ego et Hebeckkasim...

(c) Dixit... Intravi in Hebeckkasma bachaz id est domum...

zu erhoffen sein. Eine Neuausgabe nach den vorhandenen Handschriften wäre jedenfalls zwecklos, nachdem uns STAPLETONS sorgfältige Vergleichung der Druckausgaben mit dem arabischen Original schon einen bedeutend verbesserten Text geschenkt hat.

Die in ZETZNER'S *Theatrum Chemicum* (1622 bzw. 1660) und in MANGETS *Bibliotheca Chemica Curiosa* (1702) enthaltene *Tabula Chemica* ist ein bis in die Einzelheiten treuer Nachdruck der Erstausgabe, die ohne Jahr und Ort vermutlich um 1560/70 in Basel bei PERNA gedruckt wurde (21), nur sind diese jüngeren Drucke jetzt mit Untertiteln, Randbemerkungen und anderen Hilfen für den Leser versehen. Auf das Widmungsgedicht, das schon in der Erstausgabe über dem Bild steht und bei ZETZNER die Überschrift „Editor ad Lectorem“ trägt, brauche ich nicht besonders hinzuweisen. Dass der breitspurige Titel „Senioris Antiquissimi philosophi libellus, ut brevis, ita artem discentibus, et exercentibus, utilissimus, et vere aureus“ vom Herausgeber herrührt und der echte Text erst mit „Dixit Senior Zadith filius Hamuel“ beginnt, bedarf ebenfalls keiner weiteren Begründung. In den Zwischentiteln, den kleinen Randnoten und dem reichlich angewandten Kursivdruck sind Hilfen des Herausgebers zu sehen, durch die er den Lesern die Lektüre des schwierigen Werks zu erleichtern suchte; die Grundfehler des Textes, die auf schlechter Übersetzung und Überlieferung beruhen, haben sie nicht beseitigen können.

Es wurde schon in der Einleitung erwähnt, dass der lateinische Text lediglich die erste Hälfte der *Epistola* und des Kommentars wiedergibt, und dass die im Original eingeschalteten Gedichte, von wenigen Versen abgesehen, unterdrückt sind. Es ist wohl möglich, dass der Übersetzer eine Handschrift vor sich hatte, in der die zweite Hälfte des Kommentars verloren war, aber es ist nicht wahrscheinlich, dass in seiner Vorlage auch schon die *Epistola* verstümmelt war und alle Gedichte fehlten, und es ist noch weniger anzunehmen, dass die rund fünfzig von STAPLETON

(21) SCHMIEDER zitiert in seiner *Geschichte der Alchemie* eine Ausgabe Strassburg 1566. Die anonyme Ausgabe zeigt auf dem Titelblatt einen Mann mit Pfeil und Bogen. Die Typen sind absolut die gleichen wie in dem 1568 bei PERNA gedruckten Büchlein *Pyrophilia vexationumque liber* und dem ebenfalls in Basel gedruckten *Compendium Alchimiae* des GARLANDIUS, die in dem Exemplar der Preuss. Staatsbibliothek mit dem SENIOR zusammengebunden sind.

festgestellten Lücken des Prosatextes schon in der arabischen Vorlage vorhanden waren. Sicher ist dagegen, dass der dem Übersetzer vorliegende Text gegenüber den von TURĀB 'ALĪ benützten Handschriften Varianten aufwies, die in der Übersetzung zum Ausdruck kommen — und dass der grösste Teil der Abweichungen entweder auf die unzulängliche Übersetzung oder auf die verdorbene Überlieferung des lateinischen Textes zurückzuführen ist.

Ich möchte das zunächst an einzelnen Worten und Wendungen und dann an grösseren Textstücken nachweisen. Natürlich wird die Wiedergabe der arabischen Worte in lateinischer Umschrift nicht so überzeugend wirken können wie eine Gegenüberstellung der arabisch geschriebenen Worte.

Schreibfehler im arabischen Text liegen vor, wenn z.B. die drei von TURĀB 'ALĪ benützten Handschriften übereinstimmend, aber falsch *bi'l-milḥ* „mit dem Salz“ bieten, während der Lateiner richtig *bi'l-mukhkh* „vitello“ übersetzt; wenn die drei Texte *min nabāt al-ard* „vom Gewächs der Erde“ haben, wo es nur *min turāb al-ard* „de limo terrae“ heissen kann; oder wenn umgekehrt der Lateiner *tāj* „corona“ übersetzt, wo es nach den drei Handschriften *thalj* „Schnee“ heissen müsste (22).

Fehlübersetzungen des Lateiners und schiefe Auffassungen des arabischen Textes sind auf jeder Seite nachzuweisen. Ein besonders übles Beispiel ist die durchgängig falsche Wiedergabe des arabischen *warq* (*wirq*, *wariq*, *waraq*) durch „folium“ statt durch „argenteum“. Dadurch, dass der Übersetzer die in der Alchemie ganz geläufige Bedeutung „Silber“ verkannte, ist ihm schon die richtige Übersetzung des Titels des Kommentars unmöglich geworden, in welchem *al-mā' al-waraqī* das „Silberwasser“ bedeutet, und wie *aqua foliata*, sind auch die Ausdrücke *terra foliorum*, *color foliorum*, *folia vulgi*, *proiicite folia*, *vertite aurum in folia* usw. verfehlte Übersetzungen.

Unmittelbar verständlich werden die zahlreichen Fälle sein,

(22) Die Stelle S. 40 Z. 11 des arabischen Textes ist in beiden Fassungen nicht zu verstehen. Es handelt sich um den Embryo, der sich zu einer bestimmten Zeit gegen die Brust der Mutter erheben und dort entweder „wie der Schnee“ oder — nach der lateinischen Übersetzung — „wie die Krone“ werden soll. In den weitläufigen Beschreibungen der Entwicklung des Embryo bei QAZWINI habe ich nichts Entsprechendes finden können.

wo es sich um reine Schreibfehler und um falsche Auflösung von Abkürzungen im Bereich der lateinischen Überlieferung handelt. Hier hat STAPLETON zahlreiche verdorbene Stellen durch Beiziehung des arabischen Textes ohne weiteres klären und richtigstellen können. Es mag genügen, in den folgenden Beispielen dem falschen Ausdruck den richtigen gegenüberzustellen. Wer in lateinischen Handschriften Bescheid weiss, wird keine Erläuterung nötig haben.

Sperat *melius* comedere — lies: mel (*'aslan*)
ovum habens multa nomina — lies: bonum (*khair*)
 sex *filias* bzw. *violis* — lies: phialas, phialis (*qawārīr*)
 in *toto* Elbarba — lies: in tecto (*fī saqf*)
 sine *alio* — lies: sine alis (*bilā janāhain*)
 significat per hoc *solamen* — lies: salem (*al-milī*)
opera und *opaca* — lies: (h)epata (*akbād*)
multitudinem — lies: similitudinem (*'ala 'l-tasbih*)
 et *verisimilibus* — lies: et versibus (*wa-aš 'ārī*)
 et *hoc magna* sua gratia etc. — lies: in libro magnesia sua...

Besonders schlimm steht es mit der Überlieferung von Eigennamen oder unübersetzt gelassenen arabischen Worten. Hier sind der Willkür der Abschreiber keine Schranken gesetzt, und man wird sich nicht wundern, dass die Entstellungen sich in ähnlicher Weise häufen, wie ich das vor einigen Jahren für die *Turba Philosophorum* nachgewiesen habe.

An zusammenhängenden Sätzen wird sich das Verhältnis zwischen Urtext und Übersetzung und die fortschreitende Verderbnis des Textes noch überzeugender nachweisen lassen. Ich führe zunächst einen Ausspruch des HERMES als Beispiel an, zu dem noch eine lehrreiche Parallelstelle vorhanden ist.

Alte Ausgabe S. 70, Th. Ch. V, 1660, S. 219: „... et in aqua est maximum secretum. Hoc modo autem fit, ut in fermento fermentum, et in oliva olivae, et in quibusdam arboribus gummi, et in persicis oleum. Et omne genitum habet principium ab aqua“.

Die Parallelstelle S. 87 bezw. S. 225 lautet: „... et in hac aqua est maximum secretum. Aqua enim est, quae fit in tritico frumentum, et in oliva oleum, et in quibusdam arboribus gummi, et in persicis pinguedo, et in omnibus arboribus fructus diversi“.

Das Arabische zur ersten Stelle (S. 35, Z. 2 v.o.) würde wörtlich übersetzt wie folgt lauten: „... et in aqua (est) secretum magnum. Et haec aqua fit in tritico fermentum, et in vite vinum, et in oliva oleum, et in butam arboribus gummi et in sesam pinguedo; et (omne) gentium habet principium ab aqua“.

Der zweiten Stelle (S. 39 letzte Zeile und S. 40 oben) entspräche: „Et in

aqua (est) secretum magnum. Et ecce aqua est id, quod fit in tritico fermentum, et in vite vinum, et in oliva oleum, et in butam arboribus gummi, et in sesam pinguedo; et in omnibus arboribus fructus diversi“.

Man sieht leicht, dass es im ersten Text ursprünglich „in frumento“ statt „in fermento“ und „oleum“ statt des zweiten „oliva“ geheissen haben muss, während im zweiten „frumentum“ durch „fermentum“ zu ersetzen ist. Das sind natürlich nur Schreibfehler. Rebe und Wein, die im Lateinischen fehlen, werden in der Petersburger Handschrift (R) an der zweiten Stelle ebenfalls vermisst. Ob „in quibusdam arboribus“ eine Aushilfe für das dem Übersetzer unbekannt *butam*, *butum* „Terebinthe“ ist, oder eine von einem Abschreiber vorgenommene Korrektur aus „in *butam* arboribus“ vorliegt, wage ich nicht zu entscheiden. Jedenfalls hat aber der Übersetzer *simsim* „Sesam“ mit *mišmiš* „Aprikose“ und die Aprikose mit dem Pfirsich verwechselt, ohne an der Unsinnigkeit seiner Übertragung Anstoss zu nehmen. Das Wort „pinguedo“ für *duhn* ist nicht zu beanstanden, der Übersetzer hätte wohl „oleum“ geschrieben, wenn dies nicht schon für *zait* „Olivenöl“ verbraucht gewesen wäre.

In einer andern Stelle kommt die Verwandtschaft der Vorlage des Übersetzers mit der Petersburger Handschrift R besonders deutlich zum Ausdruck. Wir lesen Th. Ch. V, S. 207: „Nominaverunt similiter cinerem suum calcem, et vitrum, et lithargirium suum, et aquam mundam, quia mundata est a tenebris animae, a materia nigredinis. Separatur enim ab ea malitia ejus, quae est terrestritas mala. Et haec sunt folia et flores ejus scilicet anima, et spiritus ejus qui sunt in ea, et vocaverunt aquam coloratam a coloribus suis“.

Dem gedruckten arabischen Text (S. 25, Z. 5) entspräche die Übersetzung: „Et nominaverunt hunc cinerem suum talcum, et vitrum, et nominaverunt eum etiam aquam mundam, quia mundata est a tenebris animae. Et est frater nigredinis, et removerunt ab eo turpitudinem, quae est terra eorum, et est argentum et soror eius, inquam anima et spiritus (qui sunt) in eo, et nominaverunt eos aquam mundatam a sordibus“.

Die Abweichungen der Texte haben verschiedene Gründe. „Calcem“ ist eine häufige Verschreibung für arab. *ṭalq*, „lithargirium suum“ war ein Zusatz in der Hs. des Übersetzers. Die Lesart „a materia nigredinis“ wird durch R mit *wa-mawādd al-sawād* bestätigt, während die beiden anderen Hss. *wahuwa akhū* (im Druck falsch *akhr*) *al-suwād* lesen. Das Wort *khubthahu* „sein Hässliches“ ist etwas ungeschickt mit „malitia“ wiedergegeben, und „terrestritas mala“ wird wieder durch R *arḍiyyatuhu*

'*l-khabītha* bestätigt. In „folia et flores“ ist „flores“ wohl eine durch das vorangehende „folia“ veranlasste Verschreibung für „sorores“. Für „coloratam a coloribus“ weiss ich keine Erklärung, da das arab. *al-mušaffā min al-athfāl* kaum zu einer Fehlschreibung im Sinne der Übersetzung Anlass bietet.

Es braucht nach diesen Stichproben kaum noch einmal gesagt zu werden, welche Verheerungen im Lauf der Zeit nicht nur in der Übersetzung, sondern auch im arabischen Text sich eingestellt haben, und wie schwer es ist, eine lateinische Fassung herzustellen, die den Anforderungen der kritischen Philologie auch nur einigermaßen Genüge leistet.

III. — Der Aufbau des Lehrgedichts

Im arabischen Text vermittelt IBN UMAILS Bemerkung, dass er seine Qaṣīde für ABULḤUSAIN 'ALĪ IBN AḤMAD AL-'ADAWĪ verfasst habe, und dass sie aus fünfzeiligen Strophen mit dem Endreim *lām* bestehe, den Übergang zur *Epistola Solis ad Lunam crescentem*, arab. *Risālatu'l-šamsi ila 'l-hilāli*. Diese Worte bilden zugleich die erste Zeile der ersten Strophe und hätten als Titel nochmals in grösseren Typen vor das Ganze gesetzt werden sollen, zumal IBN UMAIL in Strophe 88 noch ausdrücklich den Titel bestätigt. Bezeichnet man die mit *lām* endigenden Verszeilen mit a, die abweichenden Reime mit b, c, d, ... , so ist der Bau der Strophen durch

a a a a a , b b b b a , c c c c a , d d d d a , ...

gekennzeichnet; aber von Strophe 79 an wendet IBN UMAIL bis zum Ende nur den Reim auf *lām* an, so dass hier die Künstelei auf die Spitze getrieben ist. In der Übersetzung ist natürlich jede Andeutung der Strophengliederung zerstört, aber durch Zusammenfassung der inhaltlich zusammengehörenden Strophen zu grösseren Abschnitten eine gewisse Übersicht über den Aufbau des Ganzen herbeigeführt.

Einen „Brief der Sonne an den Neumond“ kann man das Gedicht nur mit allem Vorbehalt nennen. Es beginnt noch in der ersten Strophe mit der Ankündigung der Sonne: „Siehe, ich werde dir Schönheit verleihen, ein Licht, durch das du zur Vollkommenheit gelangst, durch das du zu jeder hohen Ehre

emporsteigst“. Darauf antwortet der Mond : „Siehe, du bedarfst meiner wie der Hahn der Henne, ich aber bedarf auch deiner“ usw., und von Strophe 8 bis 14 gibt die Sonne in einer Schilderung ihrer Macht und wunderbaren Wirkung die Antwort. Alles weitere ist schon Kommentar : „Die Erläuterung davon enthebt dich des Fragens“ heisst es am Schluss von Strophe 14.

Für uns ist die erste Frage, was denn hier „Sonne“ und „Neumond“ bedeuten, die sich wie Hahn und Henne oder (Str. 4) wie Mann und Frau nötig haben, um durch ihre Vereinigung im „Tempel des Gebärens“ etwas Neues zu erzeugen. Es wird nirgends mit klaren Worten gesagt, auch im Kommentar nicht, und wer in der Symbolik der Alchemie ein Neuling ist, wird kaum darauf kommen, dass die Sonne, die der Schlüssel zu jedem Tor sein soll, nicht nur auf das Gold, sondern auch auf das grosse Elixir zu beziehen ist, und der Neumond, der kalt und feucht ist, das Quecksilber vorstellt (23). In den Strophen 20 bis 39, die im lateinischen Text durch die Überschrift *Tinctura* vereinigt sind, wird auf die Schwierigkeit der Darstellung des Elixirs hingewiesen und die Torheit der Leute gegeisselt, die es aus allen möglichen ungeeigneten Dingen zu gewinnen trachten. In den Abschnitten *Fixatio* und *Sublimatio* der Strophen 40 bis 53 sind die ersten Anspielungen auf die in der Vorfabel beschriebenen Figuren enthalten. Mit der Überschrift *Coagulatio* beginnt der eigentliche Kommentar : „Hoc carmen sequitur expositio[nem] figurarum eius et imaginum verbis planis et manifestis“ etc.

Versucht man nach der ersten Durchsicht des Inhalts in die Einzelheiten der Übersetzung einzudringen, so steht man bald vor unergründlichen Geheimnissen und weiss nicht, soll man seinen eigenen Verstand oder den des Übersetzers bezweifeln. Es ist ziemlich einerlei, aus welchen Abschnitten man die Beispiele entnimmt, sie stellen das Einfühlungsvermögen überall auf die gleiche harte Probe. Was bedeutet „quod restat sine dubietate, est in firmamento directo determinante“? Was „haec est deal-

(23) Das Quecksilber wird in den griechischen Quellen, von denen auch IBN UMAIL noch abhängt, allgemein durch ☿, das Zeichen des wachsenden Monds dargestellt. Der abnehmende Mond ☾ bezeichnet das Silber, der Merkur ☿ das Zinn. Vgl. E. O. v. LIPPMANN, *Entstehung und Ausbreitung der Alchemie*, S. 347 ff., und vor allem C. O. ZURETTI, *Catalogue des Manuscrits Alchimiques Grecs VIII, Alchemistica Signa*, S. 26, 28, 32 u.a.

batio, detegens dubium societatis ad aquam nubium“? Oder was soll man mit Sätzen wie den folgenden (Th. Ch. V, 196) anfangen: „Omnis praeparatio vana est propter hanc, illius rei quam composuerunt prohibitione eius ab actu suo infirmata est. Facta ignota, propter hoc, ne cognoscat omnis animus concupiscenciam suam. Fluit, quod videntes dicant“? Hier hört jedes Verständnis auf, und man ist wieder gezwungen, zum Arabischen zurückzukehren, um wenigstens einigermaßen Ordnung herzustellen. Man entdeckt auch hier die gleichen Fehlerquellen, falsche Interpunktionen und schiefe Übersetzungen, aber auch Schwierigkeiten, die in der Sache selbst liegen, in der unverständlichen Symbolik, in der Wahl ungewöhnlicher Worte, in gewollter Dunkelheit. Ich möchte an dieser Stelle noch einmal ein Beispiel behandeln, an dem man den Abstand zwischen Urtext und Übersetzung und die verschiedenen Fehlerquellen kennen lernen kann.

Wir lesen Th. Ch. S. 196 unten: „Et hirci deinde quaerunt in testis capitum, et in nervis, et in ventribus, cum vita sit sine ipsis. Nonne hoc est ex paucitate distinctionum ignorantium et vituperantium? Si dicerem aves homines, aut grana tritici fructificant galbanos. Aut palma portavit mala etiam granata, aut volatilia portaverunt pisces; Respondetur fabulam dixisti: Non generant res, nisi sibi similia, aut fructificant res, nisi fructus suos, nonne convertentur a sua ignorantia? Oves malae, et a vituperio actus earum ipsis veniunt, sed prius a dubitatione“.

Die Stelle entspricht den Strophen 31 bis 34 des arabischen Textes, die ich in deutscher Übersetzung wiedergebe (24):

(31) Ist das nicht eine verkehrte Welt (von Leuten)?

Und aller Verstand unter ihnen verdreht?

(Sie sind) Gehäuse, die der verwirrte (Verstand) ziert —

Wenn sie redeten, würden wir sagen: Sie sind Böcke,

Sie haben die Rechtleitung und die Wahrheit für den Irrtum verkauft.

(32) Mit welchem vernünftigen Recht wird gesagt: In den Schädeln

Und den Eiern samt dem verborgenen Innern der Muscheln,

Ist das wahre Gold (enthalten) ohne Widerspruch?

Ist das nicht ein Zeichen von Mangel an rechtem Urteil,

Eine Rede der Elenden, des Pöbels, der Gemeinen?

(24) Für die Richtigstellung der Verderbnisse des arabischen Textes und die Verbesserung meiner Übersetzungsversuche bin ich meinem Freunde Dr. P. KRAUS zu besonderem Dank verpflichtet.

- (33) Wenn gesagt würde, ein Schaf hat einen Menschen geboren,
 Oder ein Weizenkorn hat Erbsen wachsen lassen,
 Oder eine Palme hat einen Granatapfel getragen,
 Oder Vögel haben Fische zur Welt gebracht,
 So würden sie schimpfen und sagen: Du redest Unsinn.
- (34) Bringen die Dinge anderes zur Welt als von ihrer Gestalt?
 Oder tragen die Bäume anderes als ihre Tracht?
 Wie manche Schar hat sich (solchen) Gedanken in ihrer Torheit hingegeben,
 Gemeinsam mit den Bösewichtern und ihrem hässlichen Treiben;
 Die haben von Alters her Unsinniges vorgebracht.

Man sieht, der Übersetzer hat die Strophen 31 und 32 so zusammengestrichen und verändert, dass man den Urtext nicht wiedererkennt. Von Str. 31 ist nur „hirci... quaerunt“ = *aḫ-ṭuyūsu bā'ū* geblieben, aber *bā'ū* falsch übersetzt, in Str. 32 ist eine Menge von Verschreibungen oder Fehlübersetzungen enthalten, und nur Str. 33 ist so vollständig, dass man auf festem Boden steht. Auf die weiteren Abweichungen, insbesondere in Str. 34, und die Fehler des arabischen Textes will ich hier nicht eingehen (25).

Von Strophe 54 an steht nur noch der arabische Text zur Verfügung. Der Charakter des Gedichts bleibt weiterhin der gleiche, man findet einige neue Hinweise auf die symbolischen Figuren, Anspielungen auf den verachteten Stein, der auf jedem Markt zu finden ist (26), Andeutungen chemischer Operationen und andere dunkle Reden, ohne dass ein durchgehender Gedanke sichtbar wird. Es wird wohl noch lange dauern, bis eine halbwegs begreifliche Übersetzung des arabischen Textes gegeben werden kann, zumal auch der Kommentar sich nicht an den Gedankengang des Gedichts hält, sondern alle möglichen anderen Vorstellungskreise in seinen Bereich zieht.

IV. — *Der Charakter des Kommentars*

Es wurde bereits erwähnt, dass der lateinische Kommentar nach der Überschrift *Coagulatio* beginnt, die den vorausgehenden Teilüberschriften gleicht und auf einen verlorenen Abschnitt der

(25) Die wichtigste Korrektur ist *makhābi'i* „die verborgenen Orte“ für *mahābiri* „Tintenfässer“ in Str. 32. Die dritte Zeile von Str. 34 ist von P. KRAUS nach Varianten von P und I wiedergegeben.

(26) Vgl. J. RUSKA, *Turba Philosophorum*, S. 193, 195 nebst Anmerkungen.

Epistola hinzuweisen scheint. Die Vermutung wird durch den arabischen Text nicht bestätigt, und man muss den Grund für die Wahl des Wortes darin suchen, dass gleich in den ersten Sätzen des Kommentars von „aqua congelata“ und „aqua currens“ die Rede ist: „Congelatum autem est eadem aqua, tamen est congelata, et aqua currens est mater congelati; et ex ea et est et fuit femina, et iste masculus“. Der Satz „Alterum est ignis quietus, et est terribilis, forma eius gloriosa“, der dem über das Wasser vorangeht, fehlt im Arabischen, ebenso der Schluss „et ex ea ... masculus“. Volle Übereinstimmung stellt sich erst mit dem Ausspruch der MARIA ein, dass das von ihr erwähnte Wasser ein König sei, der vom Himmel herabsteige, und den die Erde mit ihrer Feuchtigkeit empfangt, so dass sich das Wasser des Himmels mit dem der Erde vereinige usw. So wie hier schon am Anfang, ist auch weiterhin in den Aussprüchen des HERMES, des MARQŪNAS, des KHĀLID, des ARMIYĀNUS u.a. für einen gewöhnlichen Verstand nichts von Beziehungen zu den symbolischen Figuren oder zu dem Brief der Sonne an den Neumond zu entdecken. Es bleibt uns nur übrig, dem Verfasser zu glauben, dass in dem, was er uns auseinandersetzt, unter den verschiedensten Ausdrücken derselbe Sinn verborgen liege und alles zu dem gehöre, was man auf der Tafel im Tempel gesehen habe :

„Verum duo soles qui sunt in uno, et sol simplex, est terra existens sub ipsa aqua splendente. Et radix huius aquae sunt ambae aves colligatae, quarum utraque retinet caudam alterius, et radix harum avium est luna plena, et haec est Magnesia et Abarnahas perfectum.

Quidquid autem pervenit ad te ex parabolis, similitudinibus, nominibus, gemmis, floribus, sulphure, arsenico, et argento vivo, de Cambar, et omne nigrum, rubeum et album : Et omnia humida ex acetis, lactibus, sanguinibus, urinis, spermate, fellibus et his similibus : Haec omnia significant hanc aquam divinam. Et omnis aqua (est) ei similis, quia assimilaverunt eam omni subtili ex humidis et aliis, et ovo (lies : omni) composito ex rebus“.

Natürlich ist es nicht möglich, die Inhaltsangabe des Kommentars oder gar eine Vergleichung des arabischen und lateinischen Textes in dieser Weise weiterzuführen. Ich beschränke mich darauf, noch einige Bemerkungen über die äusseren Unterschiede der beiden Texte anzufügen, um dann in diesem Abschnitt noch IBN UMAILS persönliche Äusserungen zu den Aufgaben der Alchemie, im nächsten die von ihm beigezogenen Quellenschriften etwas eingehender zu behandeln.

Der mit *Explanatio Tabulae* überschriebene Abschnitt des lateinischen Textes entspricht im ganzen dem mit *qāla* beginnenden mittleren Teil von S. 16 des arabischen Drucks. Die Eingangsworte „Feci *inimicos* in carmine figurarum et imaginum“ müssen wohl in „Feci *mentionem* ...“ verbessert werden. Die Schlussworte „Dixit Sapiens : Haec explanatio, demonstratio est sine invidia, nec aliquid typici feci, sed eam plenam et manifestam indicavi“ gehören nach Ausweis des Arabischen an den Anfang des eigentlichen Kommentars.

Der Herausgeber des arabischen Textes hat der S. 15/16 umfassenden Einleitung die durch die Hss. nicht belegte Überschrift *Tafsīr al-Qaṣīda* „Erklärung des Gedichts“ vorangestellt. Der eigentliche Kommentar hat die Überschrift „Anfang der Erörterung des reinen Silber-Wassers und der Stern-Erde“. Weitere Überschriften sind nur spärlich vorhanden. Die von S. 24 „Dies ist die Zeit des Anfangs des ersten Werks“ entspricht annähernd der Stelle im lateinischen Text, die mit „De duabus avibus invicem iunctis“ überschrieben ist, die von S. 39 ist belanglos, die von S. 41 „Geschichte des Verfassers mit dem Scheich ABULḤUSAIN IBN WAṢĪF“ bezieht sich nur auf die erzählte Episode. Von den eingeschalteten Gedichten ist das umfangreichste eine Qaṣīde auf *rā* S. 21 bis 23, längere Bruchstücke findet man noch S. 25/26, 52, 54 und 63, kleinere Anführungen an etwa 16 Stellen. Auf den letzten 40 Folioseiten der Druckausgabe sind aber nur noch zwei Verse angeführt.

Sieht man davon ab, dem Verfasser auf all seinen Wanderungen durch das Labyrinth der Allegorien zu folgen, so wird man doch wenigstens wissen wollen, wie er sich persönlich zu den von ihm erläuterten Lehren verhält, und welche Wichtigkeit er sich selbst und seiner alchemistischen Schriftstellerei beilegt.

Die Träger des geheimen Wissens sind die „alten Weisen“. Wer darunter zu verstehen ist, ergibt sich wenigstens teilweise aus den Autorennamen, die im Kommentar angeführt werden. Alchemisten, die aus Eigennutz oder mit anderen Absichten irreführende Lehren aufgestellt haben, werden als „Neider“ bezeichnet und sind auch in der *Turba Philosophorum* eine bekannte Erscheinung (27). Auch die wahren Weisen haben sich wechsell-

(27) J. RUSKA, *Turba Philosophorum*, Namenregister S. 362.

der Namen und Symbole bedienen müssen, um ihre Geheimnisse nicht der Menge preiszugeben, aber alle ihre Bezeichnungen deuten doch nur auf ein einziges Ding und eine einzige Operation hin. Wer sich mit heiligem Ernst in die Bücher der Weisen vertieft, wird den eindeutigen Sinn der Bezeichnungen und Allegorien erfassen und zur Darstellung des Steins gelangen; wer die Namen aber wörtlich versteht und von ungeeigneten Ausgangsstoffen her oder durch falsche Operationen zum Ziel zu kommen sucht, wird in die Irre gehen.

Diese und ähnliche Gedankengänge kehren im Kommentar fast auf jeder Seite wieder, bald in einzelnen Sätzen, bald in zusammenhängenden Ausführungen, in denen IBN UMAIL vor falschen Wegen warnt und seine eigenen Verdienste herausstreicht. Es wird genügen, einige Proben herauszugreifen, die von der Schreibweise und den Ansprüchen des Verfassers ein Bild geben. Ich entnehme sie den Teilen des Kommentars, die noch ins Lateinische übersetzt sind, gehe aber vom arabischen Text aus und berichtige gröbere Fehler des Lateiners in Anmerkungen.

Ar. Text S. 31, Mitte (Th. Ch. V, 1660, S. 214): „So spende Allah dem Erhabenen reichlich Dank, mein Bruder, und halte dich abseits von den Menschen und führe ein einsames Leben wie dein Lehrer (28), und richte deine Gedanken unablässig auf alles, was ich dir in Gleichnissen gesagt und erläutert habe. Im Besitz der Erläuterungen meiner drei Bücher wirst du imstand sein, den Kern der Reden der Weisen zu erfassen und alle ihre Allegorien, Bilder, Beschreibungen und Gleichnisse zu erklären, so dass du ihren Stein und ihre Verfahren verstehst; es sei denn, dass einer von ihnen sein Buch absichtlich verdunkelt und seine Darstellung schwierig gemacht hat, indem er aus Geiz und Neid und mit absichtlicher Verdunkelung (29) „nehmt das und das“ sagt. Schau also nicht in ein Buch von dieser Art, und zweifle nicht an dem, was von uns an dich gelangt ist. Und wenn dir die Ignoranten widersprechen oder dich durch Wortstreit in Irrtum zu verstricken suchen, so rücke nicht mit dem heraus, was du weisst, und lass dich von ihren Nichtigkeiten nicht durch die Ähnlichkeit mit der Wahrheit, die zu dir gelangt ist, in Zweifel

(28) Die Bezugnahme auf den Lehrer fehlt in der Übersetzung.

(29) Lat. „iniuste“. Das Wort *zulman* kann auch so verstanden werden.

versetzen. Halte dich an die Wahrheit, wo sie auch sei, und lass jene Leute und das, was sie sich zuschreiben. Ich habe in meinem Zeitalter keinen gefunden, der nicht in seine eitlen Lügen verstrickt und in seinen Irrtümern befangen gewesen wäre, so dass er wegen der Grösse seiner Unwissenheit und seines Mangels an Verstand (30) keine Beachtung verdient. Ich selbst aber habe dich, indem ich dir diese Ansichten erläuterte, zu einem der ersten Kenner dieser Weisheit gemacht, während alle anderen Leute, die die Kunst zu erlangen streben, wegen ihrer Unwissenheit dem Vieh gleichen...“.

Noch anspruchsvoller klingt es, wenn IBN UMAIL S. 43 sagt, er habe das, was die alten Weisen an Allegorien und Rätselreden auf Tausenden von Blättern niedergelegt hätten, auf wenigen Seiten zusammengefasst, und man besitze die ganze Weisheit, wenn man seine drei Bücher, das Buch „Schlüssel der höchsten Wissenschaft“, das Buch „Magnesia“ und das vorliegende Werk studiert habe, oder wenn er S. 92 seinen Lesern sagt, dass sie niemals einen finden würden, der so viel wie er von den Geheimnissen der Wissenschaft aufgeklärt habe: „Was sie von dieser Weisheit durch geheimnisvolle Allegorien verdunkelt haben, ist (durch mich) strahlender Tag und aufgehende Sonne geworden, mit einer Klarheit ohne Nebel und ohne Verhüllung, jede Wahrheit offenbarend, jede Lüge vernichtend — wo findest du dies heute beim Lesen anderer Bücher?“

Solchen Grosssprechereien gegenüber, die nun einmal zum Stil der Alchemie gehören, ist es nicht überflüssig, an die Tatsache zu erinnern, dass IBN UMAIL in den Jahren 900 bis 960 gelebt hat (31), also jünger ist als JĀBIR und AL-RĀZĪ. Wenn er AL-RĀZĪ totschtweiget und gegen JĀBIR an verschiedenen Stellen seines Werks polemisiert, so ist klar, dass sich hier zwei Auffassungen von Alchemie gegenüberstehen, die unvereinbar sind: die allegorische, die sich in Rätselreden und unfruchtbaren Allegorien erschöpft und notwendig zu geistiger Verödung führen musste, und die praktische Richtung, die unermüdlich experimentierend zupackte und schliesslich zur Chemie von heute führte.

(30) Lat.: „et defectum interitus“, lies: ... „intellectus“.

(31) H. E. STAPLETON, *Memoirs* XII, a.a.O. S. 121 ff.

V. — *Die von Ibn Umail benützten Quellen*

Man mag IBN UMAIL noch so grosse Verdienste um die Erklärung der Schriften der alten Weisen zugestehen, er ist und bleibt ein Kommentator, und wir kritischen Historiker werden ihm für das, was er von älteren Quellen in seinen Kommentar gerettet hat, mehr zu danken bereit sein, als für seine Paraphrasen, die uns nicht weiterführen.

Eine erste Übersicht der Namen (32) zeigt, dass wir uns der gleichen Literatur gegenüber befinden, die ich in der *Tabula Smaragdina* und der *Turba Philosophorum* zu kennzeichnen versucht habe: einer Mischliteratur also, die ihre fingierten Autorennamen teils aus rein griechischer, teils aus ägyptisch-hellenistischer Überlieferung entnimmt und, wo dies nicht ausreicht, neue, nirgends sonst fassbare Namen hinzuerfindet. Was davon schon vor der Besetzung Ägyptens durch die Muslime vorhanden war, von dem, was erst im 8. und 9. Jahrhundert hinzukam, reinlich zu scheiden, ist ganz unmöglich. Ich habe schon an anderer Stelle (33) eindringlich darauf hingewiesen, dass die Sammlung der griechischen Alchemisten, die in der Zeit des SUIDAS zustande gebracht wurde, keineswegs ein Bild der um 600 oder 800 noch vorhandenen Literatur gibt; das fast gleichzeitige, umfangreiche Autoren- und Titelverzeichnis im *Fihrist* des IBN AN-NADĪM liefert den Beweis, dass den muslimischen Alchemisten im 9./10. Jahrhundert von Ägypten aus noch reichere Reste von griechischer oder griechisch-arabischer Literatur zur Verfügung standen, als sie im *Codex Marcianus* und den von ihm abhängigen Hss. enthalten sind. Nur eine umfassende Sammlung aller arabischen Reste würde die Grundlagen für eine Sichtung und Schichtung der Überlieferung bieten, die zu bestimmten Urteilen führen und Entwicklungsreihen aufdecken könnte. Die Übersicht, die ich hier gebe, soll wenigstens auf Gruppen mit gemeinsamen Zügen hinweisen, und mag jüngere Kräfte zu weitergehenden Studien anregen.

Ich beginne mit HERMES, dem Vater der Alchemie, genauer gesagt, mit HERMES TRISMEGISTOS, der der ägyptischen Götter-

(32) *Memoirs*, Index S. 207-213.

(33) *Turba Philosophorum*, S. 261-274.

gestalt des THOTH entspricht. In den griechisch erhaltenen Alchemieschriften wird seiner auffallend selten gedacht (34), und die ihm dort zugeschriebenen Aussprüche lassen sich mit den Anführungen bei IBN UMAIL nicht zur Deckung bringen. Immerhin besteht die Möglichkeit, dass einiges von dem, was IBN UMAIL als Lehre des HERMES ausgibt, etwa die Unterscheidung der beiden Dämpfe, der Satz über das Goldsäen u.a. auf alte Überlieferung zurückgeht. Aber die beiden Sendschreiben (Risalen) über die Paarung des Männlichen und des Weiblichen und über den Krieg der Tempelsterne, die HERMES verfasst haben soll, sind sichtlich ägyptisch-arabischen Ursprungs und scheinen auch wesentlich jünger zu sein als die dreizehn HERMES-Schriften, die IBN AN-NADĪM im *Fihrist* aufzählt (35). Besonders beachtenswert ist die wiederholte Anführung der *Tabula Smaragdina*, die S. 64 in einer Art Kommentar gipfelt, in dem IBN UMAIL die Verbindung mit seinen eigenen Lehren herzustellen sucht (36).

Eine andere, noch nicht näher untersuchte Entwicklung liegt in der Gestalt des HERMES BŪDASHĪR vor, der S. 53 als Sohn des ARĪNAS oder ARĪS, S. 74 als ABŪ DASHĪR, Sohn des ARAS bezeichnet wird und eine an AMNŪTHĀSIYĀ gerichtete Lehrschrift *Risālat al-sirr fi'l-kīmiyā'* verfasst haben soll (37). Der Name BŪDASHĪR klingt an PETOSIRIS und BŪṢĪR an, AMNŪTHĀSIYĀ erinnert an AUTHĀSIYĀ und andere Entstellungen von THEOSEBEIA. Die Varianten von ARAS, zu denen ich nach einer Lithographie aus dem Besitz von G. BERGSTRÄSSER noch ARĀMĪS und ARBĪS hinzufüge (38), gehen wohl sämtlich auf ARĪS zurück, nur ist damit für die Erklärung des Namens noch nichts gewonnen.

Im Kommentar werden S. 89 in einer seltsamen Geschichte, die von ALEXANDERS Eroberung der ägyptischen Stadt Theben handelt, die Götterpaare Zāwush (Zeus)-Afrūdīṭī, Aras (Ares)-

(34) *Tabula Smaragdina*, S. 11-32.

(35) Ed. G. FLÜGEL, S. 353, *Turba Philosophorum*, S. 269.

(36) Der Satz „Sein Vater ist die Sonne und seine Mutter ist der Mond“ wird auf die beiden Vögel bezogen, die auf der linken Tafelhälfte abgebildet sind. In dem Satz „Das Feine ist edler als das Grobe“ soll durch „das Feine“ das göttliche geistige Wasser und durch „das Grobe“ der erdartige Metallkörper bezeichnet werden. Der Satz „Darum flieht vor ihm die Finsternis“ wird dahin erweitert, dass auch die Krankheiten durch das Licht vertrieben werden.

(37) Vgl. *Tabula Smaragdina*, S. 66, 67.

(38) *Tabula Smaragdina*, S. 66, Anm. 3.

Beiyā, Aqrūnas (Kronos)-Hamāda erwähnt, S. 59 kommt neben falschem ZĀWUSH auch ARAS als Name des Planeten Mars vor — wir begegnen hier also Erinnerungen an die griechischen Planetennamen, aber nicht dem ARAS, dem die Rolle des Vaters von HERMES zugeteilt wird. Hier kann man wohl nur an HOROS denken, so sinnlos auch die Beziehung ist, und so schlecht die Umschrift den Namen wiederzugeben scheint.

Es läge kein Grund vor, sich bei diesen Kleinigkeiten aufzuhalten, wenn derselbe ARAS nicht zugleich an zahlreichen Stellen des Kommentars als ein Hauptvertreter alchemistischer Weisheit zu Wort käme und schon in einem wesentlich älteren Buch, dem von BERTHELOT veröffentlichten *Kitāb al-Ḥabīb*, eine bedeutende Rolle spielte. Hier finden wir ihn als König ARAS im Lehrgespräch mit HERMES, MARIA, PLATO, ZOSIMOS und andern Philosophen, bei IBN UMAIL spricht ARAS der Weise bald mit dem König TAYŪDHARAS oder TŪDHARAS oder auch einfach mit dem „König“, bald befindet er sich mit QAISAR, dem König von Rūm im Zwiegespräch (39). Bei dieser Sachlage wird es kaum nötig sein, zu beweisen, dass ARAS, THEODOROS und QAISAR weiter nichts als literarische Figuren sind, denen jeder historische Hintergrund fehlt.

Ganz das Gleiche gilt für die Gestalten, die sich um den König MARQŪNAS oder MARQŪSH gruppieren, der öfters ohne Titel, sonst als der König, S. 99 auch als der weise König MARQŪNAS erscheint und S. 32, bei der berühmten Allegorie vom Löwen, mit seiner Mutter, S. 53 und 61 mit MĪTHĀWUS, dem Haupt der *Qāṭirīn*, d.h. der mit der Destillation arbeitenden Alchemisten, S. 35, 63, 86 und 99 mit SĀNAQJĀ oder SAFANJĀ im Gespräch auftritt (40). MARQŪNAS wird in einem von BERTHELOT veröffentlichten kleinen Text, der dem 13. Jahrhundert angehört (41), zum König von Miṣr (Unterägypten), SAFANJĀ zum König von Ṣa'īd (Oberägypten) gemacht: man sieht, wie die Phantasie dieser alchemistischen

(39) STAPLETON betrachtet QAISAR als einen anderen Namen für den König THEODOROS. Ich möchte die beiden Personen auseinander halten und sehe QAISAR als Eigennamen an; *qāla Qaisar* und *li-Qaisar* gegen *qāla 'l-malik*, S. 72, und *ayyuhā 'l-malik*, S. 85.

(40) Ich vermute in MĪTHĀWUS älteres MATTHĀWUS (vgl. MĪLĀWUS und MENELAOS), in MARQŪNAS eine Weiterbildung von MARQŪSH, das durch die Vorlage des Lateiners bezeugt wird.

(41) M. BERTHELOT, *La Chimie au Moyen Age*, III, S. 124.

Schreiber und Abschreiber weiterwuchert, und wie zwecklos es wäre, hier nach geschichtlichen Persönlichkeiten und Hintergründen forschen zu wollen. Schliesslich ist auch ASFĪDŪS, alias ASFĪDRŪS, ASFĪDHIYŪS, SAFĪDŪS, SĀQANDAS (42), anderwärts ASQĪDŪS, ASFANDAS, SAKHANDAS (43) zu den willkürlich erfundenen alchemistischen Autoren zu rechnen, mit denen man sich abfinden muss, ohne auf eine Aufklärung ihres dunkeln Ursprungs hoffen zu können.

Eine Textprobe, die ich S. 53 des arab. Drucks entnehme, mag ebenso zur Kennzeichnung der im Vorhergehenden genannten Autoren, wie als Beispiel der Zitiermethode dienen, die IBN UMAIL in seinem Kommentar anwendet. Der Text schliesst sich unmittelbar dem Ende der lateinischen Übersetzung an.

„Und ich habe gefunden, dass die Weisen hinsichtlich der Asche uneinig sind. Denn unter ihnen gibt es solche, die sagen: 'Vom Körper eins, und von der Asche soviel wie sein Drittel.' Der Körper ist (hier) soviel wie ein Drittel des Wassers, nämlich drei Teile für die Weissung.

Und es sagt ARAS zum König TAYŪDHARAS: 'Nimm von dieser Asche einen Teil, und bewahre sie sorgfältig auf, hochverehrt bei dir, sie ist die Krone des Sieges.' Nach diesem sagt er: 'Wenn du das behandelte Wasser, nämlich das Quecksilber des Zinnobers, mit dem roten Schwefel gemischt hast, so tue in beide ein wenig von dieser Asche, die du aufbewahrt hast, als eine Art Hefe.' Er nennt die Erde also roten Schwefel, und er sagt in Bezug auf die Asche 'ein wenig,' nachdem er (vorher) 'einen Teil' gesagt hat.

Und es sagt HERMES BŪDASHĪR IBN ARĪNAS zu AMNŪTHĀSIYA: 'Nimm vom Stein des Goldes oder vom blätterigen Talq einen Teil.' Er meint den zweiten Körper, den ARAS 'roten Schwefel' nennt, und es nennt ihn BŪDASHĪR 'blätterigen Talq.' Darauf sagt er: 'Dann nimm von diesem Gift soviel als die Hälfte des Talqs' und nennt die Asche 'das Gift.'

Und es sagt MITHĀWUS zu MARQŪNAS: 'Nimm vom Talq der Weisen, den du kennst, von dem Gewicht...' Er verheimlicht sein Gewicht, über das ein anderer 'einen Teil' sagt, 'und tue es in es drei Teile von dem geteilten Wasser.' Dann sagt er: 'Und tue in es von der Hefe, die ich dich kennen gelehrt habe, einen Teil.' Er meint die Asche, die das Gift ist, dann macht er sie gleich dem Gewicht des Körpers.

Und es sagt MITHĀWUS auch in seinem grossen Sendschreiben: 'Teilet das Wasser in neun Teile und nehmet von ihnen ein Drittel, das sind drei Teile, und bringet es in den Talq der Weisen, den goldartigen, das ist soviel wie das Drittel dieses Drittels.' Und er sagt über die verbrannte Asche, die geistartig geworden ist: 'Er hat euch von ihr ein Drittel des Talqs zugeteilt.' Und das ist ein Drittel des Drittels, und er nennt den weissen Körper goldartigen Talq.

(42) Varianten der von TURĀB 'ALĪ benützten Hss.

(43) J. RUSKA, Ein dem CHĀLĪD IBN JAZĪD zugeschriebenes Verzeichnis etc., *Der Islam* 18, S. 295. Vgl. auch *Turba Philosophorum*, S. 270.

Und es sagt HERMES in seinem Sendschreiben, bekannt als *Krieg der Pyramidensterne* (es heisst auch *Erdsterne*): 'Der ursprüngliche feurige Teil, der sein Fundament ist, und ein Teil der Erde.' Er macht also hier den Körper und die Asche zu einem.

Und es sagt ein anderer Weiser: 'Nimm von dem Rückstand — ich meine die Asche — einen Teil im Gewicht, einen Teil von den neun Teilen.' Er meint mit den neun das Wasser. Und er sagt: 'Dann stütze dich auf den ursprünglichen Stein und nimm von ihm zwei Teile, soviel wie ein Teil des Wassers und des Rückstands beträgt.' So macht dieser Weise den Körper zu zwei Teilen und die Asche zu einem Teil.

Und es sagt TAYŪDHARAS: 'Nimm drei Mithqāl Magnesia.' Dann sagt er: 'Und nimm von der Asche, die du von der *Qar'a* (Curcubita) weggenommen hast — das ist der Rückstand — ein Mithqāl, dass es vier Teile werden,' So ist die Asche ein Viertel davon.

Und es sagt ANDARĪS: 'Es wird von der festen Erde ein Teil genommen, und von der Hefe — das ist die Askūriya (44) und die Asche — ein viertel Teil.'

Dies ist also ihre Uneinigkeit in Bezug auf die Asche hinsichtlich der Mehrung und Minderung“.

DEMOKRITOS und seine angebliche Schülerin, die Jüdin MARIA, sind nur mit kurzen Sätzen und Definitionen im Kommentar vertreten. S. 47 wird das Wort des DEMOKRITOS von dem Stein, der kein Stein ist, erwähnt, S. 56 ein Ausspruch, der an die in der *Turba* S. 280 ff. zusammengestellten Vorschriften erinnert. MĀRIYA, die hebräische Gelehrte, steuert vorwiegend einzelne Bezeichnungen und Decknamen bei, spielt also entfernt nicht die Rolle wie im *Kitāb al-Ḥabīb*, wo ihre Wechselgespräche mit verschiedenen Philosophen, insbesondere dem ZOSIMOS, den Hauptinhalt des Buches bilden. Ich möchte meine Vermutung, dass das im *Fihrist* an zweiter Stelle erwähnte „Buch (der Gespräche) der Koptin MARIA mit den Philosophen, als sie sich bei ihr versammelten“, auf einer Verwechslung mit der Versammlung bei KLEOPATRA beruhe (*Turba* S. 273), jetzt dahin abändern, dass IBN AN-NADĪM das *Kitāb al-Ḥabīb* gemeint hat, in welchem tatsächlich eine Versammlung, wie sie der Titel andeutet, vorausgesetzt wird.

ZOSIMOS, im arabischen Text ZŪSAM, beim Lateiner ROSINUS, ist S. 40/41 mit Ausführungen über die *αἰθάλαι*, arab. *athāliyā* vertreten, was der Übersetzer durch ‚assalia‘ umschreibt, S. 87 ff. mit einer seltsamen Allegorie, die auf die Eroberung der Länder Miṣr, Nūba and Fāris Bezug nimmt. Auf S. 82 wird ein Send-

(44) Umschrift des gr. *σκωρία*, Schlacke.

schreiben an AUTHĀSIYĀ d.h. THEOSEBEIA erwähnt, das von der Magnesia handelt; man müsste aber mehr als ein paar Zeilen davon kennen, um über den Inhalt ein Urteil zu gewinnen.

Ein Autor WARĀṬIS, den STAPLETON zögernd mit BŪSĪṬAS und dessen Varianten BARŪṬAS, BŪṬIS, BŪṬAMAS, BŪṬAS zusammenstellt und für PETASIOS hält, scheint mir eher auf KRATES hinzuweisen, zumal auch der Inhalt der betreffenden Stellen mit dem des KRATES-Buchs verwandt ist (45). Der Unterschied zwischen dem alten KRATES-Buch und den Stellen bei IBN UMAIL besteht hauptsächlich in der anderen Einkleidung. Dort erhält KRATES durch einen Engel in Visionen Belehrungen über Alchemie, hier gibt er sie selbst an eine Versammlung von Weisheitsuchenden weiter. Wir gelangen mit diesen Wechselreden zwischen einem Lehrer und der Schar der Wissenschaftbeflissenen, *ma'shar ṭalabat al-'ilm*, auf geradem Wege zur *Turba Philosophorum*, die ja nur eine höhere und verwickeltere Stufe einer solchen lernbegierigen Versammlung ist, sofern der namenlosen Schar nicht ein einzelner Weiser, sondern eine ganze Gemeinschaft (*jamā'a*, turba) von Philosophen gegenübergestellt wird.

Ich muss hier nochmals auf die Beziehungen eingehen, die zwischen der *Turba Philosophorum* und den Schriften IBN UMAILS vorhanden sind, nachdem STAPLETON die These vertreten hat, dass nicht IBN UMAIL bei der *Turba*, sondern der Verfasser der *Turba* bei IBN UMAIL Anleihen gemacht habe (46). Die Stelle, die einwandfrei den Beweis liefert, dass IBN UMAIL die *Turba* kannte und benützte, befindet sich im arabischen Text S. 101, Z. 6 ff. und lautet :

„Es sagt AKSIMIDUS AL-JAR'ANI, einer von den Schülern PYTHAGORAS' des Italikers, — er wird auch PYTHAGORAS, das Haupt der Seher genannt — in einer seiner Reden vor der Versammlung der Schüler über das, was sie von den Gleichnissen festlegten, nachdem ihnen ihr Lehrer, der weise PYTHAGORAS, befohlen hatte, für die Nachlebenden, die nach ihnen kommen würden, ins Licht zu setzen, was die Neider verdunkelt hatten (es ist also notwendig, dass du diesen

(45) Graphisch besteht nicht die geringste Schwierigkeit, *Warāṭis* in *Qarāṭis* zu verwandeln. Bei BŪSĪṬAS usw. ist nicht zu verstehen, wie ein ū in die Umschrift von PETASIOS kommen sollte.

(46) Mem. S. 128, Note 1 : „as the order in the *Mā' al-Waraqī* has been inverted by the compiler of the *Turba*“. S. 132, Note 1 : „it is difficult to avoid the conclusion that the *Turba* compiler made use of the *Mā' al-Waraqī* as one of his sources“.

Hinweis in der Rede des AKSIMIDUS beachtest): Das Wasser und das Feuer sind Feinde...“

Man kann die in der *Turba* vorliegende Situation kaum klarer und unzweideutiger zum Ausdruck bringen, als es in diesen Worten geschieht. Hätte STAPLETON S. 128 statt der Einleitung der ersten Druckausgabe die der ältesten Form der lateinischen *Turba* neben den Text des IBN UMAIL gestellt, so wäre sofort klar gewesen, dass IBN UMAIL seine Bemerkungen der *Turba* selbst entnommen hat. Diese Einleitung lautet :

„Narro, quod magister meus, *Pitagoras Italus*, sapientum magister et *vatum caput*, tantum donum Dei et sapientiae habuit, quod nemini post Hermetem datum est. Discipulos igitur eius iam multiplicatos et per omnes regiones principes constitutos ad hanc preciosissimam artem tractandam voluit congregare, ut eorum locutio sit radix (lux ?) *post se venturis*. Iussit autem, ut Eximiedrus prius loqueretur, qui optimi erat consilii“ etc.

Mit den Umstellungen und Änderungen, die IBN UMAIL mit der Rede des AKSIMIDUS vornahm, will ich mich hier nicht weiter beschäftigen, da ich bei der Konfrontierung der Texte überall auf die Urform der *Turba* zurückgreifen müsste, wo STAPLETON die jüngere Bearbeitung als Vergleichstext benützt hat (47).

Wir sind mit der *Turba* bis an das 10. Jahrhundert, also die Zeit IBN UMAILS herangekommen und haben jetzt nur noch den mit Namen angeführten arabischen Alchemisten einige Worte zu widmen.

KHÄLID IBN YAZĪD wird an neun Stellen, wovon zwei nur Wiederholungen sind, mit einem oder zwei Doppelversen erwähnt, die zur Bestätigung von Worten anderer Alchemisten dienen. S. 38 wird eine Äusserung über das „rote Ei“ mitgeteilt, S. 84 lesen wir „er meint das Blei des MARIYĀNUS, worüber KHÄLID IBN YAZĪD belehrt wurde“. Man kann daraus entnehmen, dass die Legende von den alchemistischen Studien des KHÄLID bei dem Mönch MARIANUS, deren Entwicklung ich in *Arab. Alchemisten I* verfolgt habe, auch IBN UMAIL schon bekannt war, und dass man den Prinzen KHÄLID bereits zum Träger einer alchemistischen Reimkunst gemacht hatte. Neue Tatsachen erfahren wir aber nicht, und umfangreichere Gedichte sind uns erst viel

(47) Ich verweise für alles Weitere auf *Memoirs*, S. 128-133, und *Turba Philosophorum*, S. 33-45 und 296-318.

später, so besonders durch den Verfasser des *Kitāb al-'ilm al-muktasab* überliefert (48).

Noch bedeutungsloser als die KHĀLID-Zitate sind die Verse, die IBN UMAIL von DHU'L NŪN AL-MIṢRĪ anführt, und die Bemerkungen, die er S. 58 über eine Qaside und andere alchemistische Schriften des ägyptischen Mystikers zum Besten gibt. Unmittelbar vorher aber befasst er sich auch mit JĀBIR IBN ḤAYYĀN, und was er hier und in späteren Teilen des Kommentars über den geheimnisvollen Autor sagt, darf auch in diesem Bericht nicht mit Stillschweigen übergangen werden.

Auf S. 58 behauptet IBN UMAIL nach einer masslosen Anpreisung der eigenen Verdienste, dass ihm auch von dem nichts entgangen sei, was JĀBIR in seinem Buch *al-Khālis al-mubārak* von den „Reden der Weisen“ und in dem als *al-Mujarradāt* bekannten Werk von den „Reden des Mönchs“ niedergelegt habe. In diesen beiden Werken habe er die Kapitel seiner (früheren) Bücher aufgehoben und auf die Worte der alten Weisen hingewiesen. Nach Mitteilung von P. KRAUS gibt es ein besonderes „Buch des Mönchs“ (*K. al-Rāhib*, Ms. Paris 5099), das die angeblichen Beziehungen JĀBIRS zu einem der Alchemie kundigen Mönch behandelt.

Auf S. 102 rügt IBN UMAIL, dass die Leute, die sich in der Wissenschaft auf die Bücher von JĀBIR stützen, seine Worte buchstäblich verstünden und erwarteten, dass JĀBIR ihnen mit seinen Angaben über die anzuwendenden Stoffe ein nützliches Wissen schenke und ein Licht aufstecke, wie sie die *Kīmiyā'*, d.h. das grosse Elixir, aus verbrennlichen und vergänglichen Tier-, Pflanzen- und Mineralstoffen darstellen könnten. Auch die Warnung S. 32, in der die Alchemisten, die mit Eiern und Haaren und mit trockenen, verbrennlichen, vergänglichen, hinfälligen, stinkenden und hässlichen Dingen arbeiten und von ihnen ein Elixir zur Verwandlung des Silbers zu gewinnen trachten, als Leute bezeichnet werden, die im Finstern tappen, scheint in erster Linie auf JĀBIRS Schriften zu weisen, wenn uns heutigen Lesern auch nicht einleuchten will, dass man seine klaren Vorschriften anders als wörtlich verstehen solle.

(48) E. J. HOLMYARD, *Kitāb al-'ilm al-muktasab* etc., Paris 1923, S. 40, 44, 45, 48, 49, 51 und 52.

An anderen Stellen, besonders S. 93-97, versucht sich IBN UMAIL mit der Lehre JÄBIRS von den zwei Brüdern, die am Ende der Zeit erscheinen sollen, auseinanderzusetzen, indem er sie in seiner allegorischen Weise auf Sonne und Mond umdeutet. Ich kann zu diesen Versuchen IBN UMAILS vorerst nur auf Untersuchungen von P. KRAUS hinweisen, die in Bälde zu erwarten sind und im Rahmen der gesamten Lehre JÄBIRS auch die Deutungen IBN UMAILS behandeln werden.

VI. — *Allegorische und praktische Alchemie*

Die im Kommentar angeführten Quellen und Autoren geben uns die Möglichkeit, die Stelle, die den Schriften IBN UMAILS im Entwicklungsgang der alchemistischen Literatur zukommt, genauer zu umgrenzen und dadurch zugleich andere Richtungen der Alchemie in klareres Licht zu rücken.

Das Durcheinander altüberlieferter und neuer Namen weist auf eine uns noch ziemlich verschlossene literarische Entwicklung hin, die zwischen dem 7. und 10. Jahrhundert in Ägypten stattgefunden haben muss. Die alten Namen HERMES, DEMOKRITOS, PLATO, ZOSIMOS, MARIA sind Zeugen für das Fortleben der griechisch-ägyptischen Überlieferung, aber sie beweisen nicht, dass IBN UMAIL irgendwie noch aus uns unbekanntem Resten der alten Literatur hat schöpfen können. Wenn schon in den uns erhaltenen echten ZOSIMOS-Schriften nur wenige HERMES-Zitate vorkommen, kann ihr häufigeres Auftreten bei den Arabern nur daraus erklärt werden, dass spätere Alchemisten dem HERMES neue Schriften und Aussprüche unterschoben haben, und wenn in der griechischen Literatur nicht vorkommende Alchemisten wie AROS und THEODOROS, MARQŪNAS und SAFANJÄ bei IBN UMAIL eine so grosse Rolle spielen, werden ihre angeblichen Lehrgespräche Alchemisten der arabischen Zeit ihre Entstehung verdanken.

Wie es ein vergebliches Bemühen wäre, den wirklichen Urhebern der dem AGATHODAIMON, HERMES oder PLATO, der MARIA oder KLEOPATRA zugeschriebenen griechischen Schriften und Reden auf die Spur kommen zu wollen, so ist es verkehrt, die späteren handgreiflichen Fälschungen auf die Namen von ägyptischen Königen, römischen Kaisern und schliesslich arabischen Kalifen

und Prinzen ernst zu nehmen. Es gehört zum Wesen dieser Literatur, dass sie für ihre Offenbarungen und Allegorien einen geheimnisvollen oder imponierenden Hintergrund braucht, und sie beschafft sich diesen Hintergrund, indem sie ihre Lehrsätze und Rätselworte an die Entdeckung von Geheimschriften und Testamenten der alten Weisen oder an Lehrgespräche bekannter und unbekannter Propheten und Könige knüpft. Wer die wahren Verfasser dieser Offenbarungsschriften und Lehrgespräche gewesen sind, die der Zeit IBN UMAILS vorausgehen, werden wir nie erfahren. Wir können nur versuchen, aus dem Inhalt selbst Zeugnisse für ihr relatives Alter und ihre literarische Abhängigkeit zu gewinnen, die uns die fortschreitende Entwicklung einigermaßen verständlich machen.

Dass die Erfinder der Allegorien und Lehrgespräche keine Rücksicht auf geschichtliche Möglichkeiten kannten und willkürlich Personen und Namen durcheinandermengten, die nicht die geringsten Beziehungen zueinander, ja auch nicht die geringsten Beziehungen zur Alchemie hatten, dass sie jede ältere Quelle abschrieben und umfälschten, die ihnen für ihre Zwecke etwas zu bieten schien, dafür ist die *Turba Philosophorum* das klassische Beispiel. Wir würden aber dem unbekanntem Verfasser und allen anderen Alchemisten, die ihre Gedanken und Erfindungen zu Papier gebracht haben, bitter Unrecht tun, wenn wir sie nach den Massstäben unserer Zeit beurteilen wollten. So wenig sie eine Ahnung von ägyptischer oder griechischer Geschichte haben konnten, so wenig haben sie von griechischen Philosophen und von griechischer Wissenschaft oder gar von chemischen Vorgängen und Methoden gewusst. Nur über eins verfügten sie — über eine schrankenlose Phantasie, mit der sie sich kühn über alle Wirklichkeit hinwegsetzten, mit der sie Märchen und Allegorien erdichteten und dürftigste Beobachtung mit unendlichem Wechsel der Bezeichnungen, mit grossen Worten und unerhörten Vergleichen umkleideten, um schliesslich sich und ihre Leser zum Narren zu halten.

IBN UMAIL ist ein echter Repräsentant dieser auf ägyptischem Boden erwachsenen, in immer neuen Formen und Darstellungen durch die Jahrhunderte getragenen allegoristischen Alchemie, die sich ewig im Kreise dreht und von wirklicher Naturwissenschaft so weit entfernt ist, wie ein Kindermärchen von wirklicher

Geschichte. Er befindet sich subjektiv im Recht, wenn er sich auf die alten und vermeintlich alten Autoritäten stützt und ein feststehendes Schema von Begriffen und Behauptungen mit immer neuen Bildern und Vergleichen zu erläutern sucht. In seinem scholastisch befangenen Kopf konnte der Gedanke an eine nüchterne, auf Experimente und Beobachtungen gegründete Form der Alchemie keine Wurzel fassen. So ist auch seine Abwehrstellung gegen das Gedankensystem des JĀBIR IBN ḤAYYĀN und sein völliges Schweigen über AL-RĀZĪs revolutionäre Alchemie, die auf jede Art von Bildersprache verzichtet und mit ihren knappen Beschreibungen der Stoffe, Apparate und Verfahren eine neue Epoche, die Epoche der wahren Chemie einleitet, vollauf verständlich.

Wir nehmen weder IBN UMAIL noch dem Verfasser der *Turba* etwas von ihrer zeitgebundenen Bedeutung, wenn wir die Unfruchtbarkeit ihrer Methoden betonen. Auch AL-RĀZĪ ist noch Alchemist im alten Sinne, wenn er unendliche Mengen von Rezepten beschreibt, nach denen man das Elixir bereiten soll. Jahrhunderte lang gehen die Reden der Allegoristen und die Bemühungen der praktisch arbeitenden Alchemisten noch nebeneinander her, überschneiden und mischen sich die Lehrschriften und Ansichten, bis endlich die allegorische Richtung an innerer Öde und Armut zu Grunde geht, während die andere das Gebäude der modernen Chemie errichtet. Dass sich die Fortentwicklung der Alchemie im Abendland in erster Linie an die Namen RASIS und GEBER knüpft, ist ebenso gerecht, wie es verständlich ist, dass die lateinischen Allegoristen sich vor allem an die *Turba* und die *Tabula Chemica* des SENIOR ZADITH gehalten haben.

(Berlin)

JULIUS RUSKA.

Une théorie aristotélicienne de la lumière du XVII^e siècle

Le petit in-quarto « *De luminis natura et efficientia* » de l'érudit italien FORTUNIO LICETI (1577-1657), paru à Udine en 1640, a partagé le sort de la plupart de ses traités : il est bien profondément oublié.

Ce n'est pas étonnant, si on se rappelle qu'en général le déclin du péripatétisme au Nord de l'Italie n'a pas encore été étudié dans tous ses détails ni par les historiens de la philosophie, ni par les historiens de la science. On rencontre ça et là plus d'une lacune désolante. L'éclat de la science de GALILÉE a été, dirait-on, trop éblouissant pour qu'on pût trouver plus tard un intérêt spécial à la science philologisante des « épigones ».

Pendant ce n'est que dans la complexité multiforme et variée de tendances hétérogènes que toute l'importance du XVII^e siècle devient manifeste. Jamais la science exacte n'avait eu tant de raisons à élucider ses propres fondements et ses propres principes. L'atmosphère de lutte favorisait l'examen philosophique de problèmes qui n'inquiétaient plus les générations suivantes et qui furent parfois oubliés sans être résolus. La verve polémique stimulait une analyse principielle des concepts scientifiques, des points de départ de la science nouvelle. Les nouveaux problèmes étaient posés : des milliers de doutes devaient fatalement naître, non seulement dans les esprits de ceux qui s'obstinaient à défendre résolument des conceptions surannées, mais devaient incessamment inquiéter tous ceux qui étaient grandement disposés à reconnaître les progrès de la science. L'historien aurait donc tort de ne se borner ici qu'à la voie magistrale. Analyser tous les courants de cette période dans toute leur variété, mettre en pleine lumière leurs traits spécifiques, c'est une tâche nécessaire qui contribue en fin de compte à l'histoire philosophique de la « voie magistrale », marquée par les conquêtes et la marche triomphale de l'esprit nouveau.

FORTVNII LICETI GENVENSIS

In Bononiensi Archigymnasio Philosophi Eminentis

DE LVMINIS Natura & Efficientia

LIBRI TRES:

In quibus Luminis nomenclatura, necessitas, causa finalis, materialis, efficiens, formalis, productio, quidditas, affectiones, facultates et operationes omnes diligenter explicantur ex rei natura; de medio subtilis aënis dogmatibus, & difficultatibus in proposito contingentibus.

EMINENTISSIMO PRINCIPI

FRANCISCO

CARDINALI BARBERINO
S. R. E. VICECANCELLARIO.



VTINI, Ex Typographia Nicolai Schiratti. MDC XL.
SUPERIORVM PERMISSV.

Page de titre de l'exemplaire du British Museum.

La première ligne « Fortunii Liceti » mesure 10,5 cm.

Il existe un autre exemplaire de l'ouvrage à la Bibliothèque Lénine à Moscou.

Notre auteur, celeberrimus philosophus, vir πολύγραφος καὶ πολυμαθής, comme on le glorifiait autrefois, ne mériterait-il pas à cet égard notre attention spéciale ? Nous tâcherons de montrer que sa science est un amalgame bien intéressant d'idées traditionnelles et nouvelles.

Il suffit de jeter un coup d'œil sur les noms des auteurs que LICETI cite pour s'en convaincre. ARISTOTE y tient la première place. L'érudit padouan préfère donner souvent une mosaïque de textes du grand Philosophe, au lieu de parler au lecteur en son propre nom. Mais ce sont les nouvelles découvertes qu'il ne perd pas de vue, qu'il veut mettre en harmonie avec la pensée du Stagirite.

RENAN désignait CREMONINI comme le dernier des scolastiques. « La mort de CREMONINI (1631) », dit-il, « peut être considérée comme la limite du règne de cette philosophie. Le péripatétisme scolastique ne comptera plus désormais aucun partisan de quelque valeur. FORTUNIO LICETO (mort en 1656) n'en sauve les débris qu'en y faisant pénétrer l'esprit de la philosophie moderne » (1). Ce n'est pas tout à fait juste. LICETI, qui survécut à CREMONINI, aspire non moins que ce dernier à un système aristotélicien. C'est le système du grand Stagirite, les grands contours de l'édifice péripatéticien qui dominant tout.

Mais LICETI ne veut pas d'intermédiaires : le nom d'ARISTOTE, son autorité lui permettent de procéder assez librement à l'égard des commentateurs. Il ne craint pas de contredire ces derniers en fondant son opinion sur les paroles authentiques du Maître. Ses citations ne sont pas toujours heureuses et bien fondées : en défiant l'interprétation traditionnelle, en se mettant à l'abri de l'autorité du philosophe grec, LICETI profite souvent de sa liberté pour développer des idées bien à lui.

Cela ne signifie pas sans doute qu'il ne soit pas bien versé dans les écrits des commentateurs rejetés : pas moins de dix commentaires du *Περὶ ψυχῆς* sont cités dans son traité de la lumière ; mais ce ne sont plus des autorités. Les nouvelles découvertes ne l'intéressent pas moins que les écrits des aristotéliciens grecs, latins ou arabes. Quand il vient à traiter les questions d'optique, ce sont les trois traités les plus connus du Moyen Age qu'il cite : l'optique

(1) *Averroès et l'averroïsme*. 4^e éd., 1882, p. 413.

d'ALHAZEN, l'optique de WITELLO et la « *Perspectiva communis* » de JEAN PECKHAM. Il répand des éloges à WITELLO — *summus opticus, opti corum decus, perspectivorum coryphaeus* — mais il connaît le traité de MAUROLICO « *De lumini et umbra* » (Venise, 1575) et l'optique d'AIGUILLON (Anvers, 1613). On trouve dans son traité les noms de GALILÉE (*clarissimus Galilaeus*), de KÉPLER (*nobilis aevo nostro mathematicus*), de TYCHO BRAHE (*subtilissimus astronomorum nostratium*). N'oublions pas que LICETI était en correspondance avec PIERRE GASSENDI et GALILÉE (2).

Les écrits de LICETI sont archaïques si l'on veut, mais c'est un archaïsme qui tend vers des voies nouvelles, qui veut insérer dans son système les faits nouveaux et les découvertes nouvelles sans abdiquer la forme traditionnelle. Voilà pourquoi la fonction de cette forme devient parfois purement ornementale. La quantité innombrable de distinctions, des arguments *pro et contra*, semble avoir pour but unique de convaincre le lecteur par un procédé pour ainsi dire quantitatif, par le nombre des arguments avant tout. Ce n'est plus une méthode de penser, pas même une méthode d'exposer les pensées, c'est une décoration érudite. Le style de LICETI est prolix : notre auteur aime à entasser des démonstrations, à les varier infiniment, à faire paraître la même pensée sous diverses formes et sous divers aspects. Ce sont souvent de ces fausses fenêtres que la symétrie seule exige. LICETI peut être

(2) *Opera* GASSENDI, t. VI, pp. 88, 90, 150-151, 404 etc. (ed. Flor.); cf. GALILEI, *Opere*, ed. nazionale, Indice generale alfabetico, vol. XVIII. Il est vrai, CAVALIERI écrivait à GALILÉE que LICETI veut devenir célèbre « en combattant les premiers lettrés de nos temps » (GALILEI, *Opere*, vol. XVIII, p. 240). Il est vrai aussi que GALILÉE se comportait envers LICETI avec une ironie mal cachée. C'est ainsi qu'à propos du traité « *De luminis natura* », qui lui fut envoyé par l'auteur, il se félicitait de pouvoir comprendre enfin ce qu'il n'avait jamais réussi à saisir, notamment l'essence de la lumière (vol. XVIII, p. 208). Mais tout l'intérêt que LICETI porte à la science nouvelle (ne serait-ce que pour l'« aristotéliser ») témoigne que son érudition n'est pas un simple écho de traditions anciennes. M. OLSCHKI le traite fort mal dans son ouvrage « *Galilei und seine Zeit* » (Halle, 1927). Il ne serait qu'un des derniers représentants d'une érudition vaine et pédantesque. Remarquons cependant que M. OLSCHKI ne le considère que dans ses rapports avec GALILÉE, qu'il n'en juge que d'après les attestations données par GALILÉE. Comparer LICETI et GALILÉE, c'est comparer des grandeurs incommensurables. Pour saisir les traits spécifiques de LICETI, il ne suffit pas de le blâmer ou de le juger du point de vue moderne. Quant au rapprochement de LICETI et de CARDAN dans une autre note fugitive de M. OLSCHKI, il ne nous semble pas, lui aussi, suffisamment bien fondé.

considéré comme un représentant du péripatétisme baroque des plus typiques.

Il serait très important de préciser la place qui lui convient dans l'évolution générale de l'aristotélisme du XVII^e siècle. Cela supposerait cependant une analyse approfondie de tous ses écrits, de ses œuvres biologiques et médicales avant tout. Nous nous voyons donc obligés de nous borner ici à quelques observations fugitives.

L'aristotélisme de LICETI, tout en s'émancipant de l'autorité des interprètes d'ARISTOTE et en procédant parfois bien arbitrairement avec les textes du Maître, n'a pas encore atteint le point où la forme et la terminologie scolastique ne sont plus que forme conventionnelle. Il serait bien intéressant de le comparer à cet égard à GRIMALDI. Le traité du célèbre physicien met en relief le désaccord entre forme et idée. La terminologie et la composition de l'œuvre sont traditionnelles, adaptées dans tous leurs détails aux exigences de l'école. Mais ce n'est que forme, on dirait parfois un masque plutôt qu'une décoration. GRIMALDI aurait bien pu traiter les questions autrement qu'il ne l'a fait (3). D'autre part, on ne pourrait non plus appliquer à LICETI ce qui a été dit du « dernier des scolastiques », CREMONINI : « Dans l'étude même d'ARISTOTE il a la prétention de ne jamais recourir qu'au texte magistral, comme s'il ne voulait rien devoir aux interprètes qui l'ont précédé... Volontairement ou non, il est l'écho concentré et réduit des interprétations diverses qui se sont produites au sein de l'école. » (4) Quoi qu'il en soit, la formule de MORHOF (5) « *totus Aristotelicus ad superstitionem usque* » a plutôt trait aux tendances psychologiques de l'auteur qu'à une orthodoxie aristotélique strictement observée de fait.

Le traité de la lumière n'est pas le seul où LICETI ait parlé des phénomènes de lumière qui ne cessaient de l'intéresser vivement. On a de LICETI toute une série d'ouvrages ayant plus ou moins trait au phénomènes lumineux. Il suffit de nommer ici : *Litheosphorus sive de lapide Bononiensi* (Udine, 1640), *Pyronarcha*

(3) L'examen des fondements philosophiques de la physique de GRIMALDI est un ouvrage à faire. L'auteur espère pouvoir lui consacrer un article spécial.

(4) L. MABILLEAU. *Étude historique sur la philosophie de la Renaissance en Italie* (CESARE CREMONINI), 1881, p. 125.

(5) POLYHISTOR. Ed. 4, Lubecae, 1747, vol. I, p. 829.

sive de fulminum natura (Padoue, 1634), *De lunae subobscura luce prope coniunctiones et in eclipsibus observata* (Udine, 1642), *De lucidis in sublimi* (Padoue, 1641), enfin un ouvrage sur les nouvelles étoiles et les comètes (*De novis astris et cometis*, Venise, 1622) qui provoqua une vive polémique entre lui et JEAN CAMILLE GLORIOSO (6). L'ouvrage « *De lucernis antiquorum reconditis* » se rapporte à la même catégorie (7).

Voyons donc ce que contient le traité *De luminis natura*. LICETI commence par critiquer les théories de la lumière émises avant lui; sa critique n'est point l'œuvre d'une érudition purement historique, car c'est à des adversaires pour la plupart réels, récents, que LICETI fait face.

N'oublions pas que LICETI, en suivant la tradition commune, distingue *lux* (lumière du corps lumineux, source de lumière) et *lumen* (lumière répandue par le corps lumineux dans le milieu transparent, c'est à dire lumière provenant du lux) et que c'est du *lumen* qu'il veut parler dans son traité.

La première théorie est peut-être la seule à laquelle LICETI n'attache pas grande importance. Il rappelle le précepte d'AVERRÔES qui exige de commencer l'exposition des théories par la moins probable et la moins convainquante. La théorie en question est celle d'AVEMPACE, citée par AVICENNE, ALBERT LE GRAND, PIERRE D'ABANO et GILLES DE ROME. Selon cette théorie le lumen ne serait rien de réel, il ne serait qu'une pure apparence provenant

(6) NICÉRON (*Mémoires pour servir à l'histoire des hommes illustres*, t. 27, P. 1734, p. 382) constate qu'on s'y battit « plutôt par des injures que par des raisons ».

(7) Cet ouvrage, imprimé plusieurs fois, a provoqué bien de remarques ironiques. LICETI y soutient l'existence de lampes inextinguibles continuant à brûler durant des siècles. C'est l'explication de pareils « faits » étranges qui attire surtout son attention, car les premières éditions ne contenaient que quatre livres presque entièrement consacrés à l'explication des phénomènes de combustion et de lumière, et ce n'est que plus tard que l'auteur y avait ajouté une grande dissertation de caractère archéologique et mythographique. On lui a reproché une crédulité extrême. Rendons cependant justice au philosophe padouan : il n'était pas seul à croire ces légendes. Il suffit de parcourir ses citations pour s'assurer qu'il s'agit là d'une croyance fort répandue. On rencontre parmi les explications citées des théories chimiques de paracelsistes et même une théorie pour ainsi dire à la mode du temps : BONAMICUS ralliait ces « faits » au fait de phosphorescence, récemment découvert. C'est le même FR. BUONAMICI, savant de Pise, dont le volume *De motu* — un in-folio de plus de 1000 pages — est cité par LICETI dans son traité de la lumière. WOHLWILL en parle comme d'un péripatéticien du XVI^e siècle des plus typiques. (Voir GALILEI, Bd. I, Hamb. u. Leipzig, 1909, p. 69).

de la relation qui existe entre la vue et le corps lumineux. La lumière (rappelons qu'il s'agit du lumen et non du lux) n'a plus de réalité que les couleurs apparentes que nous voyons au col d'une colombe. LICETI rejette expressément cette interprétation subjectiviste de la lumière sans s'en inquiéter beaucoup (I, 1-3). Il ne s'attendait sans doute pas que précisément cet ordre d'idées devait être bientôt repris par les courants psychologues défendant la subjectivité des qualités sensibles.

La seconde théorie lui semble de beaucoup plus importante. C'est la théorie d'effluves corporels, qui venait d'être rétablie dans les esprits des physiciens grâce à la renaissance de la philosophie atomistique et qui allait dominer la physique pendant la période newtonienne. Notre auteur avait pris soin de recueillir contre cette théorie 25 arguments des plus divers, qu'il avait tirés des ouvrages d'ARISTOTE et de ses commentateurs grecs, arabes et latins et que nous pouvons nous dispenser de reproduire ici. Un argument moderne mériterait cependant notre attention spéciale. C'est la découverte de la pierre de Bologne (lapis Bononiensis), douée de la faculté de phosphorescence (8). GALILÉE, comme nous le relate LAGALLA (9), cité par LICETI, voulait voir dans ce fait de phosphorescence récemment découvert une preuve particulière en faveur de la matérialité de la lumière. La possibilité de « mettre la lumière du soleil dans un bocal » devait prouver que la lumière est une sorte de corps, dont la pierre est imbibée comme une éponge (10). La thèse d'ARISTOTE, que la lumière est la présence du corps lumineux dans un milieu diaphane, semblait difficile à réconcilier avec le fait des corps phosphorescents. On y trouvait, semble-t-il, la présence de la lumière dans un corps opaque, et de plus, il était invraisemblable que cette présence soit la présence d'une qualité incorporelle séparable,

(8) La découverte de ce phénomène a été attribuée au savetier CASCARIOLO de Bologne (1604).

(9) *De phaenomenis in orbe lunae*. Venise, 1612.

(10) GALILÉE lui-même avait vivement protesté contre une pareille interprétation de ses idées. Voir sa lettre à LICETI (*Opere*, vol. XVIII, p. 233-234. Cf. aussi 250). Il déclarait que l'essence de la lumière lui est inconnue, qu'il s'intéresse à la question *an sit*, non à la question *quomodo* (XVIII, 208). Ces déclarations sont dictées par une sorte de prudence méthodologique, elles sont un défi à l'omniscience des scolastiques. On pourrait trouver cependant chez GALILÉE maint passage qui montre une prédilection indiscutable envers l'hypothèse des effluves.

pouvant être transportée d'une place à une autre comme l'est la lumière du soleil, absorbée par la pierre. Le lapis Bononiensis devait renverser le système d'ARISTOTE, en devenir la pierre d'achoppement. On comprend pourquoi LICETI, aristotélien décidé, porta une attention si vive à la question de phosphorescence et lui consacra même un volume spécial.

Vient ensuite (I, 1-9) la troisième théorie qui considère la lumière comme forme substantielle des corps. Nous y reconnaissons de prime abord cette *Lichtmetaphysik* médiévale qui fût si ingénieusement analysée dans les ouvrages bien connus de BAEUMKER et BAUR (11). La conception de la lumière comme forme de corporéité, comme principe d'étendue et de dimensions corporelles avait subi une évolution compliquée au cours du Moyen Age. Mais cette évolution n'avait pas pris fin avec le Moyen Age, et ce n'est pas le Moyen Age seul que vise LICETI. La philosophie de PATRIZZI, exposée dans sa « *Nova de universis philosophia in qua aristotelica methodo non per motum sed per lucem et lumina ad primam causam ascenditur* (Ferrare, 1591) », n'était qu'un reflet parfois bizarre et grotesque des mêmes idées. Son auteur était, on le sait, un adversaire décidé d'ARISTOTE (12), un adversaire d'hier, dont l'activité s'était déployée dans le Nord de l'Italie, à Ferrare, à Padoue même, où quelques années plus tard devait professer LICETI. LICETI n'était donc nullement un pur historien registrant des théories démodées, il avait maintes raisons pour combattre de pareilles conceptions.

Nous passerons sous silence la critique de la théorie de THÉOPHRASTE (I, 10-12). La dernière théorie que LICETI refute est celle de JEAN PHILOPON (I, 13-15). L'un des partisans de cette conception, cité par LICETI, DANDINUS, accentue que dans sa célèbre définition de la lumière ARISTOTE avait dit *énergie* et non *entéléchie*. Cela veut dire, croit-il, que nous avons affaire à un *actus imperfectus*, à une *operatio* et non à un *actus perfectus*

(11) CL. BAEUMKER. WITELLO, ein Philosoph und Naturforscher des XIII. Jahrhunderts. Münster, 1908. (*Beitr. z. Gesch. d. Philos. d. Mittelalters*. Bd. III, Hft 2.) L. BAUR, Das Licht in der Naturphilosophie des ROBERT GROSSETESTE. (*Festgabe G. v. HERTLING gewidmet*. Freib. i. B., 1913, pp. 41-55). L. BAUR, Die Philosophie des ROBERT GROSSETESTE. Münster, 1907 (*Beiträge*, Bd. XVIII, Hft 4-6).

(12) MORHOF parle de ses *Discussiones peripateticæ* comme d'un ouvrage *invidia odioque in Aristotelem plenum*.

ou *habitus* (13). Autrement dit, la lumière n'est pas un *résultat* de l'activité du corps lumineux (un *lumen productum*), mais le *procès* même de production lumineuse (la *luminis productio*). PHILOPON recourt dans son commentaire au *De anima* (14) à l'analogie d'un artisan travaillant le bois avec une hâche : de même que l'homme communique telle ou telle forme au bois, non à la hâche, la hâche ne servant que d'instrument qui transmet l'opération de l'artisan à la matière fabriquée, de même le corps lumineux transmet sa lumière à l'œil par l'intermédiaire du milieu transparent. La théorie de PHILOPON accentue dans la théorie strictement péripatéticienne le rôle du corps lumineux. Le rôle de ce dernier a une prépondérance indiscutable comparé à celui du milieu. Le corps agit *par* le milieu, non *sur* le milieu.

Pour préciser le mode d'action lumineuse, PHILOPON a recours dans le même commentaire au *De anima* à l'analogie d'une corde tendue : de même que, mue à une de ses extrémités, elle se meut toute à la fois, ἀχρόνως, de même s'engendre l'énergie de la lumière (φωτὸς ἐνέργεια). SIMPLICIUS (15) avait employé à la même occasion l'image d'un levier ou d'un bâton : l'objet transmet l'énergie lumineuse à l'œil comme un bâton (μοχλός) transmet le mouvement de la main à la pierre. L'analogie semble remonter aux stoïciens, elle fut répétée plus tard par DESCARTES. PIERRE GASSENDI avait déjà ingénieusement remarqué cette affinité entre les deux conceptions. (16) Quelle que fût la source immédiate de DESCARTES et les circonstances qui l'aient amené à son affirmation, il est évident que la conception de PHILOPON est un cartésianisme *in nuce*. « La lumière », dit DESCARTES, « passe vers nos yeux par l'entremise de l'air et des autres corps transparens

(13) « Ἐνέργεια magis ipsum rei actum, ἐντελέχεια statum ex actu exortum significat », constate TRENDLENBURG (ARISTOTELIS *De anima libri tres*. Berol. 1877, p. 243). Cf. M. KAPPES. ARISTOTELES-Lexikon (Paderborn, 1894, p. 28) et sa remarque : « Beide Ausdrücke werden jedoch von ARISTOTELES oft ohne Unterschied der Bedeutung gebraucht ».

(14) In *Aristotelis De Anima libros Commentaria*. Ed. M. HAYDUCK. Berol. 1897. (*Comm. in Arist. graeca*, vol. XV), p. 330.

(15) In *libros Aristotelis de anima*. Ed. M. HAYDUCK. Berol. 1882 (*Comm. in Arist. graeca*, vol. XI), p. 136.

(16) « Cartesius nuper eandem bacui similitudinem arripuit », dit-il dans son *Syntagma philosophicum* (Pars II Physica, sectio I, lib. 6, cap. II, *Opera*, ed. Flor. 1727, t. I, pp. 370-371), après avoir analysé les théories de PHILOPON et de SIMPLICIUS.

en mesme façon que le mouvement ou la résistance des corps que rencontre un aveugle passe vers sa main par l'entremise de son baston. » (17)

On le voit, c'est presque à la lettre l'idée de SIMPLICIUS et de PHILOPON. Ne reconnaît-on pas, en effet, dans la définition philoponienne de la lumière comme une sorte d'activité instantanée, la conception cartésienne de la lumière, conçue non comme un mouvement, mais comme un *conatus*, une inclination au mouvement ? Par conséquent, ce n'est pas seulement la théorie de PHILOPON ou de DANDINO que LICETI combat, c'est aussi la théorie cartésienne à la veille de sa pénétration en Italie.

La position de LICETI envers les principales théories de la lumière est donc nettement définie. Quelles sont maintenant les opinions propres du philosophe ? Voici sa définition de la lumière : *Sensibilis visu qualitas physica producta a corpore lucido praesente in corpore perspicuo, cui assistit procreativa caloris, detectiva colorum et repraesentativa sensui lucidorum, a quibus conservari diu potest in diaphano.* (II, 11). On voit, c'est la célèbre définition péripatétique quelque peu modifiée.

La lumière (*lumen*), précise LICETI, est une qualité ou une forme qui dépend dans son existence de son sujet (*subjectum*), c'est-à-dire du milieu transparent. Elle ne peut être appelée cependant une forme informante (*forma informans*) car elle ne se déplace point au déplacement de son sujet : l'air agité ne déplace ni l'ombre, ni la lumière. Elle n'est qu'une forme assistante (*forma assistens*). Ces distinctions n'étaient pas bien originales. LICETI n'avait qu'à tendre la main pour les trouver dans la philosophie, en les adaptant ensuite aux questions de l'optique (18).

C'est de même une application des questions générales de philosophie à un cas spécial que nous voyons là, où LICETI pose la question : la lumière est-elle éduite (*educta*) de la puissance du milieu transparent ou bien l'y est-elle infuse de dehors (*extrinsecus inducta*) (19).

Quand LICETI traite la question de deux espèces lumineuses

(17) DIOPTRIQUE, ch. I, *Œuvres*, vol. VI, p. 4.

(18) « *Formarum substantialium alias esse informantis, assistentes alias, norunt omnes in Physiologia vel mediocriter exercitati* », constate LICETI dans son traité *De animarum coextensione corpori* (Patavii, 1616, p. 45).

(19) *De luminis natura*, II, 9.

ne se distinguant que numériquement et pouvant réellement coexister dans le même sujet, et polémise avec ZIMARA, le célèbre averroïste padouan, (20) ce sont bien encore de ces subtilités métaphysiques qui étaient si recherchées par les philosophes de Padoue.

Mais une question importante nous montre LICETI-novateur. C'est la question de propagation de la lumière. Dans le chapitre 8 du livre 2 de son traité notre auteur soutient la thèse : *Luminis originem non esse momentaneam sed tempore mensurari*. Presque tous les sectateurs d'ARISTOTE, grecs, arabes et latins, sont unanimes à maintenir que la lumière se propage instantanément. JULES CÉSAR SCALIGER seul avait des doutes à cet égard (21). « Je regrette cependant beaucoup », poursuit LICETI, « de ne pouvoir partager l'opinion de tant de savants illustres ». La lumière est une opération provenant d'un agent corporel, sa procréation est un mouvement, et puisque tout mouvement s'effectue dans le temps (*motus quilibet fit in tempore*), la lumière, elle aussi, exige du temps pour pouvoir se propager, quoique ce temps soit si bref, qu'il échappe à la perception des sens. Un second argument est destiné à confirmer la même pensée. La lumière est une forme divisible, capable de changer par grades, susceptible de rémission et d'intention (22), et c'est pour passer ces grades d'intensité qu'elle exige du temps.

Ne nous laissons pas tromper cependant par le terme mouvement. Ce terme appliqué à la lumière ne désigne aucunement un mouvement local, c'est une altération (*ἁλλοίωσις* d'ARISTOTE), comme le montre expressément LICETI lui-même, en accentuant que la génération de la lumière est la génération d'une qualité (*generatio qualitatis*) (23). Il répète plusieurs fois que la lumière comme telle ne se meut guère dans l'espace (24) : le mouvement local du lumen ne peut être qu'accidentel, et si un corps lumineux

(20) Voir *De lucernis antiquorum*, l. IV, ch. 32.

(21) « Valde ambigua res est », disait-il dans son *Exotericarum exercitationum liber XV. De subtilitate. Ad Hieron. Cardanum*. 1557. Voir *Exer.* 298, art. 2 (p. 835 de l'édition de 1620).

(22) Cette *remissio et intensio* est expliquée plus en détail dans le chap. 13 du livre 2.

(23) III, 6.

(24) Cf. : *negamus lumen proprie descendere, advenire, motuque locali cieri* (I, 6), *sine ullo motu locali* (ibid.), *non necessario secundum locum movetur* (I, 5), *nullo nititur motu locali* (II, 17).

se meut dans l'espace, ce n'est pas le même *lumen* qui se meut avec lui, ce sont de nouveaux *lumina* qui s'engendent à chaque moment dans les différents points de l'espace, car il est impossible aux accidents de passer d'une partie du milieu à une autre (25). C'est tout comme avec la chaleur : à proprement dire, ce n'est pas elle qui se meut quand un corps chaud est en mouvement, c'est toujours une nouvelle chaleur que le corps engendre dans chaque point de l'espace qu'il parcourt.

Mais cela signifie-t-il que la génération de la lumière, dont il est question dans le traité de LICETI, diffère totalement de ce que nous sommes habitués à concevoir en parlant du mouvement de lumière ? N'oublions pas que l'ingéniosité scolastique distinguait dans l'altération un côté intensif et extensif : la variation d'intensité de lumière (de même que la génération de la lumière) pouvait bien être temporelle *quoad intensionem*, sans que la propagation de la lumière dans l'espace soit nécessairement conçue comme telle. Le terme vitesse de la lumière aurait alors une signification tout autre qu'il ne l'a de nos jours. Mais telle n'est pas l'opinion de LICETI. La lumière non seulement change dans le temps les grades de son intensité, mais elle exige du temps pour remplir toutes les parties du milieu diaphane, car aucune action physique ne peut se réaliser autrement que par contact. « *Lumen a corpore lucido gignitur prius in diaphano proximo, deinde in remotiori, proindeque lumen in instanti non procreatur, sed in tempore gignitur in toto perspicuo praesente* » (26). Autrement dit, notre philosophe, en niant la possibilité d'un mouvement local de la lumière, conçu comme déplacement d'un corps ou d'une qualité, admet la possibilité d'une production successive de qualités (ou de formes) dans l'espace. Si nous disons que la lumière a parcouru l'espace *AB*, cela ne signifie aucunement que les particules ignées, la qualité lumineuse ou le milieu matériel se soient déplacés de *A* à *B*. En niant le mouvement local de la lumière c'est à un mouvement progressif de substances que LICETI songe avant tout.

Résumons : le temps de la propagation lumineuse dans le milieu matériel est un temps fini, un temps essentiellement mesurable (*propagatio luminis tempore mensuratur*). LICETI et les

(25) II, 7.

(26) II, 8.

partisans de la théorie corpusculaire sont unanimes à ce sujet. Mais LICETI ajoute à cette thèse physique une interprétation philosophique qui veut que cette propagation ne soit ni un déplacement de substances corporelles, ni un déplacement de qualités incorporelles hypostasiées, ni enfin une transmission de propriétés ou de forces. C'est une altération successive du milieu matériel, dont le mode n'est pas expliqué plus en détail.

LICETI veut que sa théorie soit celle d'ARISTOTE. Il croyait pouvoir citer en sa faveur le passage de la Physique : τὸ μεταβάλλον ἅπαν ἐν χρόνῳ μεταβάλλει. Nous savons bien qu'il n'avait pas raison, car le philosophe grec croyait à la propagation instantanée de la lumière et admettait la possibilité de changements qualitatifs instantanés (27). LICETI devrait plutôt citer un autre nom et non pas insister que son point de vue n'était partagé par aucun ou par presque aucun péripatéticien. Il avait étrangement oublié le péripatéticien JULES CÉSAR LAGALLA, dont il cite à plusieurs reprises l'ouvrage *De phaenomenis in orbe lunae* (28).

LAGALLA observe dans cet ouvrage que selon le témoignage d'ALEXANDRE D'APHRODISIAS, rapporté par AVERROËS, toute transmutation s'effectue dans le temps, quoiqu'il existe des transmutations telles que par exemple la propagation de la lumière (*illuminatio*), qui s'effectuent dans un temps imperceptible. « *Quam sententiam Alexandri ego valde probo* », dit LAGALLA, « *omnis enim transmutatio necesse est ut fiat in tempore* ». LAGALLA croit pouvoir citer en sa faveur le passage du même livre de la Physique : tout mobile est divisible. Il conclut que la lumière reçue par le milieu illuminé trouve une certaine résistance dépendant de la quantité de ce dernier, que le milieu divisible, grâce à sa divisibilité, n'est pas susceptible de recevoir une qualité dans

(27) Voir pour les citations E. ROLFES, *Die Philosophie des Aristoteles*. Leipzig, 1923, SS. 9-10, 312-313. Le savant de Padoue FR. PICCOLOMINI, l'un des nombreux *syncretistae*, selon la terminologie de BRUCKER, occupés à réconcilier PLATON et ARISTOTE, avait beaucoup plus de raisons d'écrire : « *Aristoteles negat lumen moveri, nam illustratio est actus perfectus, totus simul, hinc dicitur praesentia lucidi, et est terminus motus lucidi, quo praesente perspicuum dicitur illustratum, non illustrari* ». (*Librorum ad Scientiam de Natura attinentium partes quinque*. Francof. 1597, p. 343).

(28) Cet ouvrage est reproduit dans le volume III (partie I) de l'edizione nazionale de GALILÉE. Il est suivi d'un traité *De luce et lumine*, partiellement reproduit dans la même édition des *Opere* (vol. III, partie 2).

un moment indivisible. LAGALLA se rend très bien compte que son opinion contrarie la tradition péripatéticienne (*Opinio..... videatur fortasse contra communem et paradoxa*) (29). Il n'avait pas même le droit de se baser sur l'autorité d'ALEXANDRE. Ce dernier affirmait, il est vrai, que tout mouvement exige du temps, que l'altération est une sorte de mouvement et s'effectue dans le temps (*ἐν χρόνῳ γίνεται*), mais il en avait exclu la propagation de la lumière, car le milieu transparent est éclairé à la fois (*ἀθρόως*) par la présence seule du corps lumineux (30).

L'opinion de LAGALLA et de LICETI paraît étrange et nouvelle dans les confins du péripatétisme. Elle n'a rien d'étrange dans le contexte de la théorie épicurienne d'effluves. Il y a plus, elle y est nécessaire. N'était-ce pas en effet la théorie d'ÉPICURE-LUCRÈCE qui proclamait la vitesse inouïe (mais finie quand même) des particules ignées? N'était-ce pas la renaissance de l'atomisme qui devait fatalement restituer la thèse de la propagation lumineuse dans le temps, en préparant ainsi les esprits à l'explication de la célèbre découverte de ROEMER? N'était-ce pas GALILÉE, enclin à l'hypothèse des effluves, qui avait eu l'idée ingénieuse de mesurer la vitesse de la lumière? (31) N'était-ce enfin l'Accademia del Cimento, fidèle à l'esprit investigateur de GALILÉE, qui avait tenté la première (1657) de réaliser les projets du célèbre physicien? (32) Il est intéressant de voir comme le péripatétisme réformé

(29) *De phaenomenis in orbe lunae*, ch. XI.

(30) *De anima* II, 152 v. *Alexandri Aphrodisiensis pariter commentaria Scripta minora*. Ed. IVO BRUNS. Berol. 1887. (Suppl. Aristotelicum, vol. II, pars I), p. 143 et 145. Cf. *De anima* I, 131 r (p. 43 BRUNS) : οὐ γὰρ σῶμα τὸ φῶς διὸ καὶ ἀθρόως γίνεται. Voir aussi J. ZAHLFLEISCH, *Die Polemik Alexanders von Aphrodisia gegen die verschiedenen Theorien des Sehens. Arch. f. Gesch. d. Philos.* Bd. VIII, N. F. Bd. I (1895), SS. 379-380. C'était peut-être THÉMISTIUS qui avait donné sujet à croire qu'on pourrait alléguer l'autorité d'ALEXANDRE en faveur de la vitesse finie de la lumière. Il dit en effet dans son commentaire à la Physique d'ARISTOTE (f. 55 b) que selon ALEXANDRE tout changement doit avoir lieu dans le temps, et que THÉOPHRASTE s'en doutait, en se fondant sur l'instantanéité de la propagation lumineuse. (La même relation se trouve répétée par SIMPLICIUS. In *Arist. Phys.* f. 233 r, pp. 997-998 DIELS). Ce passage pouvait faire croire qu'ALEXANDRE et THÉOPHRASTE n'étaient pas unanimes dans la question de la lumière elle aussi.

(31) Voir *Discorsi* (1638). Cf. E. MACH, *Die Prinzipien der physikalischen Optik*. Leipzig, 1921, SS. 32-35.

(32) Cf. *Tentamina experimentorum naturalium captorum in Academia del Cimento*. Vienne, 1756, Pars 1-2, p. 183.

s'affilie à l'atomisme restauré pour s'opposer à la fois au cartésianisme qui soutenait la propagation lumineuse instantanée et à la doctrine métaphysique de la lumière immatérielle qui devait nier sa propagation dans le temps (33).

L'influence des théories mécaniques de la lumière est encore plus manifeste là où LICETI vient à parler de réflexion et de réfraction. De même que DESCARTES qui, en parlant de ces phénomènes, se voyait obligé à recourir à des analogies qui contrariaient étrangement sa thèse de propagation lumineuse instantanée (balle projetée, etc.), de même LICETI parle en catoptrique et dioptrique non plus de qualités, mais de mouvements et de forces qui ne s'accordent pas trop bien avec ses affirmations précédentes. C'est d'une *vis productiva luminis*, d'une *vis procreatrix a lucido corpore impressa lumini* (34) qu'il parle. LICETI trouve de belles analogies pour illustrer les phénomènes. Il parle tantôt d'un noyau de cerise pressé par les doigts, tantôt d'un cheval effréné à qui on a lâché la bride (II, 22). Voilà précisément ces mouvements locaux que notre auteur rejetait avec tant de vivacité.

En précisant encore plus le mode de propagation de la lumière, LICETI est obligé d'introduire une nouvelle conception. Ce n'est plus le péripatétisme, ni la théorie d'émission, c'est l'ancienne théorie des rayons visuels. On trouve dans deux chapitres — trop laconiques, hélas ! (35) — l'affirmation que les rayons de lumière ne sont guère des lignes mathématiques, mais des lignes physiques douées de trois dimensions, c'est pourquoi il serait plus juste de dire que la lumière se propage non par lignes directes, mais par les trois dimensions au-devant de soi (*non per lineas, at per superficies, immo vero per corpora secundum rectum*) (36). Les rayons de l'optique géométrique sont des abstractions, les rayons physiques sont corporels et discontinus. L'espace est rempli de lumière d'une manière non continue, mais discrète. C'est ce qui est expressément formulé dans le chapitre 19 du livre second.

(33) Remarquons qu'encore KÉPLER, en croyant à l'immatérialité de la lumière, se voyait obligé de lui attribuer une vitesse infinie. (*Ad Vitellonem Paralipomena*, 1604, chap. I, *Opera omnia*, ed. FRISCH, t. II). L'influence de la *Lichtmetaphysik* médiévale est ici évidente.

(34) II, 21 et 22.

(35) II, 18 et 19.

(36) II, 18. LICETI parle ici de *corporea rectitudo*.

Les rayons dans un milieu continu sont discrets comme tels (*discreti per se*), (37) affirme notre auteur, qui a plus d'une raison à invoquer l'autorité de la « Perspective » de WITELLO. C'est bien à la « perspective » (à l'optique) antique et médiévale que remonte sa conception. La théorie ancienne des rayons visuels sortant de l'œil les concevait comme discrets, pareils, pour ainsi dire, à des doigts écartés. EUCLIDE et WITELLO sont unanimes au sujet de la discontinuité des rayons. Mais la théorie se complique chez LICETI par des conceptions atomistiques : la multitude des rayons discrets trouve son explication dans la multitude des particules dont est composé le corps lumineux (38).

On voit que l'optique de LICETI est un conglomérat d'idées hétérogènes. Seul le système aristotélicien doit tout réconcilier et tout unifier. Notre philosophe ne partageait-il pas en secret l'opinion de MELANCHTHON : *magnam doctrinarum confusionem secururam esse, si Aristoteles neglectus fuerit* (39). Et là même où il déviait de la tradition aristotélicienne il croyait rester fidèle à la pensée du Maître.

Quel fût le sort de l'idée de LICETI sur la vitesse finie de la lumière ? On sait que les éclipses des satellites de Jupiter permirent à ROEMER de calculer cette vitesse en 1675. La théorie des effluves avait le plus contribué à la préparation de cette découverte, tandis que le cartésianisme et l'aristotélisme traditionnel s'opposaient d'une façon énergique à l'explication de ROEMER. LAGALLA et LICETI étaient restés des exceptions parmi les péripatéticiens. Quand GRIMALDI dans son traité, paru à Bologne en 1665, dans la ville même où vingt ans auparavant professait LICETI, déclare : *lumen est aliquid fluidum quod non nisi cum motu locali, adeoque cum tempore spargi potest* (40), ce n'est plus du péripatétisme, quoique les apparences scolastico-aristotéliciennes soient strictement observées dans tout le cours de l'ouvrage.

On ne pourrait pourtant dire que le traité de LICETI passa

(37) Cette théorie fut plus tard largement développée par HONORÉ FABRI dans sa *Physique*. (Lyon, 1669-1671).

(38) Cf. la définition du corps lumineux comme *magnitudo pluribus constituta particulis* (II, 19).

(39) Cf. OLSCHKI, *Bildung und Wissenschaft im Zeitalter der Renaissance in Italien*, 1922, S. 23.

(40) *Physico-Mathesis de lumine, coloribus et iride*. Bononiae, 1665.

inaperçu et ne trouva aucune résonance. Le célèbre ATHANASE KIRCHER dans la partie philosophique de son ouvrage volumineux « *Ars magna lucis et umbrae* » (41) ne fait que plagier LICETI (42). Le chapitre *De natura et efficientia luminis in mundo sublunari ejusque causalitatibus scholastica disquisitio* (43) répète avec de légères modifications les parties correspondantes du traité de LICETI. Ce chapitre contient une dissertation sur la nécessité de la lumière (cf. LICETI, II, 2) l'analyse des quatre causes de la lumière (finale, matérielle, formelle et efficiente), la preuve que la lumière n'est pas éduite de la matière (cf. LIC. II, 3-6 et 9), qu'elle n'est pas une *emanatio*, mais une *productio* (cf. LIC. II, 10) et une définition de la lumière presque identique à celle de LICETI (44). Il est aussi intéressant de comparer les chapitres sur la génération des couleurs, de l'ombre, de la chaleur, du froid, de la siccité et de l'humidité. Là, où KIRCHER traite de la connexion de la lumière et de la vie, il met beaucoup plus en relief les traits astrologiques (45). Mais ce qui est le plus intéressant, c'est que KIRCHER rejette la propagation de la lumière dans le temps, la partie la plus originale des conceptions de LICETI. Cette partie du traité ne figure aucunement chez KIRCHER. Dans un autre ouvrage du célèbre érudit « *Magnes sive de arte magnetica* » (46) on peut trouver une comparaison de la lumière et du son. KIRCHER remarque que le son se propage dans le temps, la lumière au contraire instantanément. Le « *Magnes* » de KIRCHER et le « *De luminis natura* » de LICETI parurent dans la même année. Mais on voit que même plus tard, KIRCHER n'a pas voulu changer son opinion, en préférant de ne s'approprier que les assertions les moins originales du philosophe italien.

Il va sans dire que l'analyse d'une question particulière ne

(41) Rome, 1645-1646. Amsterdam, 1671.

(42) LICETI a inséré une lettre de l'érudit allemand dans son traité *De lucernis antiquorum* (VI, 25).

(43) Pp. 21-24 de l'édition d'Amsterdam.

(44) Voici la définition de KIRCHER: *Sensibilis qualitas physice producta a corpore lucido praesente in corpore perspicuo, cui assistit procreativa caloris detectiva colorem et repraesentativa sensui lucidorum, a quibus diu conservari potest in diaphano.*

(45) KIRCHER ajoute par exemple au titre du chapitre 16 du livre II de LICETI (= lib. I pars 2): *aperitur in hoc verum astrologiae judicariae circa vitam hominis fundamentum.*

(46) Rome, 1640. Cologne, 1643. Rome, 1654.

peut nous autoriser à des généralisations définitives. Il nous semble cependant incontestable que la science de LICETI est une sorte de science naturelle philologisante qui ne pût paraître avant que la nouvelle science expérimentale ne disposât de toute une série d'ouvrages, — d'ouvrages qu'une avidité érudite, plongée dans les livres, pouvait lire et commenter de même manière qu'elle le faisait en analysant et en critiquant les textes antiques, sans s'adresser à l'expérience. Analyser l'entrelacement de la philologie et des sciences naturelles du XVI^e et XVII^e siècle, c'est un problème bien attrayant pour un historien des sciences. SCALIGER, LICETI, KIRCHER, SCHOTT — voilà quelques représentants d'une même tendance scientifique. Souvent, pour vérifier un fait, ils s'adressent non à l'expérience, mais à la critique de différents témoignages et de différents récits, comme s'il s'agissait d'un évènement historique, inaccessible à l'observation immédiate. Ce ne sont plus des discussions abstraites sur la possibilité de tel ou tel phénomène, c'est une collation de textes et de témoignages. N'oublions pas que pour la science baroque, les phénomènes exotiques, les curiosités peu connues de l'Amérique et de l'Orient avaient un attrait particulier. Dans beaucoup de cas, les savants ne pouvaient vérifier l'exactitude des faits relatés qu'en comparant différents témoignages (47). Considérer les savants pareils à LICETI en dehors de cette atmosphère baroque, ne serait-ce pas dénaturer la perspective historique, ignorer les traits spécifiques de ces auteurs oubliés ?

(Moscou.)

V. ZOUBOV.

(47) Cf. par exemple dans le *Litheosphorus* de LICETI le chap. LI (*Comparatur Italico lapidi mirabilis alius qui pridem ex India Regi Gallorum allatus fuisse*, pp. 248-264) ou le chap. LIII (*Bonomiensi Lapidi comparatur Indicus alter, quem Yta-lu nuncupant incolae Paraguay in America*, pp. 269-271.)

From Cuvier to Darwin

A PAGE FROM THE HISTORY OF COMPARATIVE ANATOMY (1)

Who is the founder of Comparative Anatomy or Comparative Morphology, if this word is preferred? SEVERINO, VICQ D'AZYR, CAMPER, HUNTER, CUVIER, GEOFFROY ST. HILAIRE have been mentioned. No definite answer can be given.

An attempt at comparative anatomical research is met with in BELON, who, in the middle of the 16th century, made a thorough comparison between the skeleton of man and a bird. SEVERINO (1645) arrived at the definite conclusion that all animals, especially the Vertebrata, have one common plan of organization. He was, however, caught in the meshes of mediaeval scholasticism, and only a precursor, as WILLIS, who introduced the term Comparative Anatomy.

BUFFON was not an anatomist. DAUBENTON, his collaborator, was no pioneer, yet CUVIER states that by his works he made comparative anatomy the basis of zoology. BUFFON himself exercised an enormous influence by his fundamental idea of a general plan, a prototype, for all animals. VICQ D'AZYR had deeper insight into the organization of the Vertebrata. He may even be looked upon as the founder of comparative anatomy, but it should be added that the foundation he laid was weak and unstable. The idea of a general plan had an important place in his concepts but it was not clearly conceived.

In the year 1794, the year in which VICQ D'AZYR died, CUVIER came to Paris. In his principle of correlation he adopted the idea of a plan of animal structure. The correlation of parts must be the expression of this plan. There is always something in common to be found among the species of every genus, for all

(1) Summary of a Swedish paper in *Nordisk Tidskrift*, 1922.

mammals, for all Vertebrata, but at this point CUVIER stopped. He postulated, as is well-known, four fundamentally different general plans, but did not elaborate any complete theoretical basis for his doctrine of types. He never explained why differences in the nervous system should be of more importance than those in the other organ systems. He did not speculate, he was entirely empirical and from his experience he concluded that the animal kingdom was founded not on one type only, not on many, but on four.

GEOFFROY ST. HILAIRE was no sober empiricist—his concept of the structure of animals was less clear, but at the same time more penetrating than that of CUVIER. It may be said that CUVIER observed the animals with a detached interest and quietly arrived at his conclusions. GEOFFROY, on the other hand, was strongly influenced by BUFFON and by *Naturphilosophie*. He had a warm feeling for the unity of nature and carried his idea of a plan of organization to its extreme consequence. For him there were only quantitative differences and fundamentally only one type of animal structure.

The struggle between these two scientists in connection with the unity of organization, is wellknown. According to the prevailing opinion of that time, CUVIER left the field victorious and he *was* of course in the right. GEOFFROY's comparisons were preposterously fantastic, but this must not hide the merits of the ingenious anatomist. As far as the development of biology is concerned CUVIER has had a far greater influence. He was the founder of an empirical comparative anatomy which was placed at the disposal of systematics. But, not without cause, GEOFFROY today is regarded as the founder of the independent discipline of animal morphology.

GOETHE, whose participation in this contest has often been described, has been variously estimated as a morphologist. It must be admitted, in my opinion, that he did not attain results of lasting value and that his ideas have been of little account for the development of science. He was, however, not altogether a dilettante whose opinions were of interest only on account of his greatness as a poet. His discovery of *os intermaxillare* in man was not new, but he realized the importance of his observations. The vertebral theory of the skull which, when he published it,

had already been introduced to science by OKEN, was a failure, and he never took any part in the building up of the theory; but it proved to be stimulating and its fundamental idea is related to the theory of the segmentation of the head, by which it was later replaced. He arrived at his theory because he needed it. It was practically a necessary consequence of his general concept of nature which, in its turn, had its roots in his pantheistic, Spinozistic philosophy. The idea of a single prototype for the animal kingdom and the doctrine of the metamorphosis of plants, had a place in GOETHE'S thought as important as the Faust motive. His ideas of natural science have sometimes been regarded with contempt as mere romantic *Naturphilosophie*. No wonder that they were filled with this philosophy; few spiritual tendencies have had such power. His keen feeling for the laws of life and of Nature's concrete reality have something to teach even a modern scientist. Typical of the difference between him and abstract *Naturphilosophie* is the fact that he for a long time seriously sought in botanical gardens for a "plant prototype," the model for all plants.

GOETHE'S idea of a prototype for the animal kingdom was influenced by HERDER, though he himself says that he had got this from BUFFON, but he gave it a more universal significance than did BUFFON and he did this before GEOFFROY ST. HILAIRE defended the idea.

In France, both CUVIER and GEOFFROY ST. HILAIRE had their successors. The circumstances are, however, complicated because BLAINVILLE, the most genuine representative of CUVIER'S doctrine, joined CUVIER'S opponents on account of personal hatred. DUGÈS and SERRES continued the work on GEOFFROY'S theory of unity. The latter assumed that all animals are only different embryonal stages of development of the same fundamental animal type. SAVIGNY, whose investigations on the structure of the mouth parts of insects is one of the most beautiful achievements in comparative anatomy, was largely influenced by GEOFFROY.

In Germany, a struggle occurred in the thirties and forties of the last century between an empirical tendency and *Naturphilosophie*. OKEN, CARUS and other adherents of *Naturphilosophie*, sided of course with GEOFFROY ST. HILAIRE; VON BAER, the great empiricist, who placed embryology on a sure footing, condemned

strongly GEOFFROY's method and introduced CUVIER's doctrine of types into Germany. Empirical anatomy was represented, after MECKEL who was in close contact with GEOFFROY, by JOHANNES MÜLLER who by his conscientious comparative method opened the period which may be said still to exist. Influenced by *Naturphilosophie* he tried, to a certain extent, to intercede in the „type struggle.”

GEOFFROY's opinion, however, found sympathy in England, the sober and practical England of STUART MILL's time, where a *Naturphilosophie* of the same kind as the German never existed and could never have existed. Not only did KNOX side with GEOFFROY against CUVIER but the critical, agnostic HUXLEY also did so, as late as 1854. Without doubt two causes co-operated in this. On the one hand, HUXLEY was psychologically so near an evolutionary concept that CUVIER's classification into four principal different types seemed to him arbitrary. On the other hand, he was strongly impressed by LYELL's refutation of CUVIER's theory of catastrophe, a line of thought strongly akin to that of the doctrine of types. In the one case we have periods and in the other types within each of which the units are without connection with one another.

But the discussion could not longer be continued in the well worn tracks. The scientist, in whom one most clearly notices a change of opinion, was RICHARD OWEN, England's foremost comparative anatomist. After many decades he still continued to speak of the well-known struggle of 1830, but his attitude on the problem had, unbeknownst to himself, become changed. His zoological system was based upon CUVIER's four types and he never thought of seeking the same plan in an insect and in a vertebrate. But it was no longer a question of fundamental differences in type, he expressly spoke of a “kinship” between forms in the different main divisions. The animal kingdom came to form a unity for him as well as for GEOFFROY.

CUVIER's strength in the struggle against GEOFFROY ST. HILAIRE was among other matters than unity or diversity of types. He made a fairly clear distinction between the concepts of analogy and homology. The one who clearly differentiated these concepts and introduced the words was OWEN (1843). Just as it is now natural for us to explain homology on the basis of a common

origin, so it was natural when idealistic morphology dominated the biology of the time, to maintain that homologous organs correspond to each other because they are various expressions of the same plan. To LOUIS AGASSIZ, the most obstinately consistent among the idealistic morphologists, this interpretation was completely satisfactory. Even OWEN was a typical idealistic morphologist, whose view of nature had its deep roots in PLATO's philosophy. The archetype of the vertebrates which he thought he had found, and of which he even made a sketch, was for him not a scheme but a reality. Divine Reason has created the idea of the archetype, which has been realized in various modifications. Nature, guided by this idea, had progressed slowly and majestically to the time when the idea of the vertebrate assumed the form of man. But OWEN did not stop at that point. He asked by what *laws of nature* and what *secondary causes* is progress governed. Already this question shows that he was on the threshold of a new period. When he said that the solution of the question had "not yet" been found, one gains the impression that, even prior to DARWIN, he thought of evolution as an explanation, but shrank from its formulation for fear of the consequences.

He lived, however, to experience these consequences. OWEN, who was a disciple of CUVIER and GEOFFROY, and who, as early as 1868, wrote that this would probably be the last time he would be able to express himself in a large work, lived until 1892. And what did he experience! He lived through the whole development of English Darwinism, and saw both its struggle and victory with HUXLEY as his own successor and HAECKEL as the transformer of the idealistic morphology into one utterly realistic.

Morphology thus became the central point in zoology and was based entirely on the theory of descent. On the other hand the theory of evolution obtained some of its most cogent proofs from morphology. The facts utilized in these proofs were not new. They had accumulated during the whole time from CUVIER to DARWIN, but they were then interpreted in quite another way. At last there came a time when the idealistic morphology reached its limits. One notices, even in such a typical idealistic morphologist as OWEN, the approach of the new era.

Although the change was close at hand in morphology, it was not in that field that the great secession took place, but in quite

another sphere of biological thought. DARWIN'S starting-point was, as is well known, derived from animal and plant geography. He got the evidence in the first place from impressions derived from English political economy and from practical breeding. Originally Darwinism was entirely a product of English political, realistic and practical concepts.

When one turns from GEOFFROY ST. HILAIRE and OWEN to DARWIN, one enters a new world of ideas. With DARWIN there is no trace of *Naturphilosophie* and hardly any feeling for the unity of nature which brought many other biologists to the border line of the idea of evolution. Hardly any morphological points of view will be found in his writings. Only when his theory of evolution was completed did he note, naturally with satisfaction, that it explained homologies. His attitude was, characteristically enough, not exactly that the facts of morphology prove a common descent, but rather that the theory of natural *selection* gives an explanation of the facts of morphology.

Darwinism, as DARWIN created it, meant not only a change in the concepts of the origin of species, but it also completely cut off old lines of development within biology. It was not long before the well-prepared-for revolution broke out in morphology. When the theory of selection, with its peculiar premises in English thought and English practical concept of nature, had given the word of release, the charm was quickly broken both in morphology and in other branches of biological research.

Uppsala.

N. VON HOFSTEN.

The Discovery of Lactic Sugar

The discovery of lactic sugar, or, as it was called by the early writers, *manna seu nitrum seri lactis*, is generally ascribed to BARTOLETI (sometimes also written BARTOLETTI, BERTOLETTI, BARTHOLET, or BARTHOLDI), who is supposed to have mentioned it for the first time in his *Encyclopaedia Hermetico-dogmatica... Bononiae*, of which there were three editions, namely, 1615, 1619, and 1621. The date of the discovery of lactic sugar is therefore sometimes given as 1615 or 1619.

As far as I have been able to ascertain, ETTMÜLLER (1) in 1736 was the first to mention BARTOLETI'S claim: "Serum lactis habet in se sal volatile nitrosum; vnde BARTHOLETUS praeparat ex sero lactis remedium, quod vocat mannam seu nitrum seri lactis, in Encyclop. p. 400." ETTMÜLLER was followed by SPIELMANN (2), BERGMAN (3), FOURCROY (4), GMELIN (5), THOMSON (6), KOPP (7),

(1) ETTMÜLLER, *Opera med. theoret. pract. nova ed aucta per Mangette*, i, p. 782, Genevae (1736).

(2) SPIELMANN *Institut de Chymie*, French translation by CADET, jun., i, p. 161, Paris (1770): "BARTHOLET, dans son *Encyclopédie hermétique et dogmatique*, est le premier qui ait parlé de ce sel."

(3) BERGMAN, *Opuscula Physica et Chemica...*, iii, p. 375, Lipsiae (1787): "Saccharum lactis a BARTOLETO primum memoratur anno 1619." BERGMAN gives the reference to *Encyclopaedia Hermetico-dogmatica*.

(4) FOURCROY, *Elements of Natural History and of Chemistry...* (English translation), iv, p. 306, London (1788): "... it appears that it was first mentioned by FABRICIUS BARTHOLET, or BARTHOLDI, an Italian physician, in the year 1619."

(5) GMELIN, *Geschichte der Chemie...*, i, p. 593, Göttingen (1797): "... der schon den Milchzucker kannte, und unter dem Namen *Manna seu nitrum seri lactis* beschreibt..." GMELIN refers to *Encyclopaedia hermetico-dogmatica... Bonon.* 1619.

(6) THOMSON, *A System of Chemistry...*, iv, p. 432, London (1817): "FABRICIUS BARTHOLDI, an Italian, was the first European who mentioned this sugar. He described it in his *Encyclopaedia Hermetico-Dogmatica*, published at Boulognia 1619..."

(7) KOPP, *Geschichte der Chemie*, iv, p. 405, Braunschweig (1847): "Des

POGGENDORFF (8), HOEFER (9), GERDING (10), WATTS (11), HIRSCH (12), JAGNAUX (13), HJELT (14), GRAEBE (15), LIPPMANN (16), and FESTER (17).

My copy of the *Encyclopaedia Hermetico-dogmatica*... complete with colophon: "Bononiae, Typis Sebastiani Bonomij, M.DC.XIX. *Superiorum permissu*.", has 321 paginated pages. ETTMÜLLER gives p. 400. The position is therefore as already stated in 1764 by HALLER (18): "... mea editio Encyclopaediae neque eum locum habet, neque tot paginas." Furthermore, my copy, even the section "De partibus lactis" (pp. 168-169), shows

Milchzuckers erwähnt zuerst FABRIZIO BARTOLETTI... in seiner *Encyclopaedia hermetico-dogmatica* (1619) ... BARTOLETTI nannte diesen Körper *manna* oder *nitrum seri lactis*."

(8) POGGENDORFF, *Biographisch-Literarisches Handwörterbuch*..., i, col. 110, Leipzig (1863): "Encyclopaedia hermetico-dogmatica, Bologna 1615, 1619 u. 1621. (Darin d. Milchzucker zuerst beschrieben, unter dem Namen: Manna seu Nitrum seri lactis...)"

(9) HOEFER, *Histoire de la Chimie*, ii, p. 237, Deuxième édition, Paris (1869): "... il a décrit le sucre de lait, sous le nom de *manna seu nitrum seri lactis*."

(10) GERDING, *Geschichte der Chemie*, p. 534, Leipzig (1869): "Der Milchzucker wird zuerst von FABRIZIO BARTOLETTI im Jahr 1619 erwähnt."

(11) WATTS, *A Dictionary of Chemistry*..., iii, p. 1022, London (1871): "... was first prepared by FABRIZIO BARTOLETTI, in 1619, from whey, thence called *Manna* or *Nitrum seri lactis*, and afterwards, *Galacticum Bartholetti*."

(12) HIRSCH, *Biographisches Lexikon*..., i, p. 317, Wien und Leipzig (1884): "... und Entdecker des Zuckers in der Milch."

(13) JAGNAUX, *Histoire de la Chimie*, ii, p. 678, Paris (1891): "Le sucre de lait a été découvert par un italien, FABRICIUS BARTOLETTI, qui le décrivit dans son *Encyclopaedia hermetico-dogmatica*, publiée à Bologne en 1619."

(14) HJELT, *Geschichte der organischen Chemie*..., p. 5, Braunschweig (1916): "Der Milchzucker wurde 1619 von BARTOLETTI entdeckt und Manna oder *Nitrum seri lactis* genannt."

(15) GRAEBE, *Geschichte der organischen Chemie*, i, p. 2, Berlin (1920): "Der Milchzucker war schon im Jahre 1619 von BARTOLETTI als Manna seri lactis beschrieben..."

(16) LIPPMANN, *Zeittafeln zur Geschichte der organischen Chemie*, p. 2, Berlin (1921): "1615. Milchzucker, krystallisierter, BARTOLETTI, 'Encyclopaedia dogmatica' (Bologna 1619)." See also LIPPMANN, *Geschichte des Zuckers*... p. 395, Leipzig (1890).

(17) FESTER, *Die Entwicklung der chemischen Technik*..., p. 108, Berlin (1923): "Eine besondere Spezialität war seit dem 18. Jahrhundert die gewerbliche Darstellung des Milchzuckers, der 1615 von FABRIZIO BARTOLETTI in Bologna entdeckt worden war." FESTER gives the reference, *Encyclopaedia hermetico-dogmatica*, Bologna (1615).

(18) HALLER, *Elementa physiologiae corporis humani*..., vii, p. 38, Lausannae (1764).

no evidence whatever that *manna seu nitrum seri lactis* was known to BARTOLETI in 1619.

Neither the date nor the source of BARTOLETI's discovery of lactic sugar is thus correctly given, and the whole question requires reinvestigation.

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M. NIERENSTEIN.

Stephen d'Irsay (1894-1934)

In the death of Dr. STEPHEN D'IRSAÏ at the American Hospital in Paris, November 16, 1934, science, and particularly medicine, loses a scholar of attainment. A peripatetic student, long exiled from his own country, D'IRSAÏ died of a lingering kidney disease, complicated towards the end by blindness. An extensive course of study in many lands was suddenly cut short at the age of forty. His published writings, and those arranged for posthumous issue, assure for him a permanent place in the history of science.

Born in Budapest, September 18, 1894, D'IRSAÏ received his early education at the Classical Gymnasium of the Calazantian Order in his native city, supplemented by studies at Lausanne, Switzerland. At the age of eighteen he was certified by the Budapest school and matriculated in the Medical Faculty of the Royal Hungarian University. His three years of medical training in the University were followed by a year as intern in the St. John's Hospital, after which service he received the degree of M.D., October 10, 1918. He remained in Budapest for advanced studies in physiology and soon became interested in the action of the heart and circulatory disorders. His first publication is concerned with the vasomotor changes in patients with influenza. This led to work in electrocardiography, a subject which became the main interest of his life for a number of years. Five months at Leyden with EINTHOVEN followed by clinical work with KRAUS at Berlin fitted him for a post under Professor ALEXANDER KORÁNYI at the Medical Clinic of the University Hospital at Budapest. Here he occupied himself studying heart disease, especially electrocardiography. A careful investigator and widely read in his special field, D'IRSAÏ's work at Budapest soon brought him to the notice of the authorities outside his native land. Fluent in the English language, he found no difficulty in transferring his activities to America.

In 1921, at the age of twenty-seven, he was appointed Research Fellow in Electrocardiography and Director of the Cardiographic Laboratory at the Michael Reese Hospital in Chicago. Here he continued his physiological investigation for a year until he entered the medical department in the University of California as instructor and resident physician at the University Hospital. As the result of his clinical work he wrote a number of papers on electrocardiology. He was considered by his colleagues as a good clinical physiologist.

It was soon evident, however, in spite of his proficiency in physiology, that D'IRSAY was becoming increasingly interested in medical history. His career as a research student in cardiology and as a clinician ended quickly and, in a manner quite characteristic of the man, he threw his whole energy into his newly chosen field. Except for an occasional paper after 1925, the result of his previous work, for the next ten years his whole output was historical in character.

Beginning in California, he completed the requirements for his M.A. degree under Professor LOUIS JOHN PAETOW in the department of Medieval History. In 1925 he transferred his activities to Yale University, where he had obtained a Seessel Fellowship in Applied Physiology. The next year, although eight years had elapsed since his graduation in medicine, he passed the general examination and became a diplomate of the National Board of Medical Examiners. Further studies in the history of medicine were carried out in the Ecole des Chartes in Paris (1927) and the Institute of the History of Medicine in Leipzig (1928). Returning to America, he took up his new position as associate in the History of Medicine in the newly founded department at Johns Hopkins University, Baltimore. Here he remained for two years under the guidance of Professor WILLIAM H. WELCH. Another change came in 1931, when he resigned his chair and went to Paris to enter the Dominican order. After a few weeks he returned to his studies, completing an important book on the history of the universities before his tragic death in 1934.

* * *

The details of D'IRSAY'S work in electrocardiography cannot be considered here. It is sufficient to point out that his ten published

papers on this and allied subjects show a sound and wide grasp of the physiology and pathology of cardiac action. A patient with heart disease became a problem in pathological physiology; a finding, an *observation provoquée*. Two excellent summaries were published during this period: "Modern Cardiology" in the *Scientific Monthly*, May, 1926, and "Pathological Physiology" in the same journal for November, 1926. These papers were the last of his series on physiology; both show evidence of the transition period which preceded D'IRSAY'S work on the history of science.

The first of a long list of papers on historical subjects was issued from California. In it we find his initial interest displayed in the medieval universities, a problem which he was to follow for the next ten years with ever increasing persistency. In this paper (1) of 1925 on the black death of the fourteenth century, the rationalistic (Galenic) thought of the professors is contrasted with the empiricism of the scattered practitioners who wrote the *Pestschriften* and the practical development of sanitation which grew out of the plague. The results of wide reading and scholarly documentation are clearly evident in this early work. Even more important, however, is his outstanding contribution to medical history of this time, "The Life and Works of GILLES DE CORBEIL" (2). So closely drawn was the picture of GILLES that the very fiber of the man became part of D'IRSAY. The author took over the medieval attitude of the unimportance of the personality compared with the counting of his works and, from 1925 on, appeared not to be concerned with his personal immortality. He, like his medieval hero, considered that the whole body of knowledge was a large stream to which each contributed his share. He well knew that the individual waves should not long be discernible; the works alone counted. That his share should be sound was uppermost in his mind. That his friends failed to understand his medieval mind, did not disturb his work, for a strong stream of valuable contributions came from his pen in the following ten years.

Minor papers dealt with medicine in the early Christian era,

(1) *Ann. Med. Hist.*, 7 : 220, 1925.

(2) *Ann. Med. Hist.* 7 : 362, 1925.

especially the influence of the church fathers, and the interlocking of religion and science in the third century. Studies on the Middle Ages included notes on the universities, particularly the University of Paris, the black death and the evolution of medicine throughout the period. By his investigations of the various aspects of medieval medicine D'IRSAY was already preparing himself for his final works on the history of physiology and the development of the European universities.

While working in the Institute for the History of Medicine in the University of Leipzig, D'IRSAY published his biography of ALBRECHT VON HALLER, his most ambitious work up to that time (1930). Extensively documented, it is perhaps the best account of VON HALLER, whose multiple interests would be the despair of any less widely read scholar than D'IRSAY.

Finally came his "Histoire des Universités Françaises et Etrangères, des Origines à Nos Jours", the first of which, on the "Middle Ages and Renaissance", was issued in Paris, 1933. The material, well organized, is supplemented by an elaborate and useful bibliography in footnotes. There are few errors or omissions, a surprising amount of detail for its size and, although the book does not displace RASHALL's "Universities of Europe in the Middle Ages", "the general reader will get [from it] a broadly satisfactory picture and the specialist, precious references" (3). The splendid illustrations and maps add not a little to the value of the book. The second volume was published in 1935. He left in manuscript, also, a history of physiology and other papers. Plans are being made for their publication.



As a man of twenty-five, D'IRSAY was slim, erect, with dark skin and hair and flashing black eyes. Courteous, intelligent and with a deep appreciation of music and art, he impressed his colleagues as a man of genius. His disregard for many of the conventionalities of life soon became evident and as the years passed in New Haven, Baltimore and in Europe, friends fell away, unable to sympathize with his maladjusted psyche. In the

(3) SELLERY, G. C. *Amer. Hist. Review*, Jan. 1934.

last five years of his life, moreover, the inroads of his fatal disease became more evident and physically a coarseness ensued which, unhappily, only served to repel his less understanding associates. Thus his life ended in a cloud, only lifted by the brilliance of his work and the staunchness of a few intimate friends. An extremely talented man of broad culture, had it been his lot to be better balanced and disciplined, he would certainly have achieved even greater things; as life was willed, his contributions to the history of science were not inconsiderable.

Harvard University

HENRY R. VIETS.

Minoan mathematics

The publication of vol. IV (in 2 parts) of Sir ARTHUR EVANS' book on *the Palace of Minos*, "A comparative account of the successive stages of the early Cretan civilization as illustrated by the discoveries at Knossos" (London, Macmillan, 1935) completes one of the most impressive undertakings of modern archaeology. Sir ARTHUR began his excavations in 1900, and in addition to many other publications on Cretan archaeology, he began to publish his *Palace of Minos*, in 1921. I am glad to hear that an index to the whole work is in course of preparation, for it is not always easy to find the answer to a definite query in these six heavy volumes including so much material and thousands of illustrations, plans, and sketches; besides, when the publication of a work has been stretched over fifteen years, one must expect some early statements to be completed or corrected later on, and the reader must be able to reconsider all of the evidence. I am especially pleased to know that the index is not prepared by an ordinary index maker but by an experienced scholar, Dr. JOAN EVANS, well known to our readers through her *Anglo-Norman lapidaries* (1924; *Isis* 9, 123-4) and sundry other books. Indeed if it be easy enough to compile a bad index, no scholar is too good to compile a good one. I am sure that Sir ARTHUR would have insisted on doing the work himself if he had been twenty years younger. The next best thing was to delegate that essential part of his task to a well-trained and intelligent scholar. I trust that thanks to JOAN EVANS' devotion, Sir ARTHUR'S "Minoan encyclopaedia" will be made to yield all of its accumulated treasures and thus facilitate ulterior studies.

One of the most interesting parts to the public of *Isis* of this volume four is the short chapter devoted to numeration and addition (p. 691-3), from which the following data are largely derived. There is the more reason for doing so, in that

NEUGEBAUFR's *Vorlesungen* on pre-Hellenic mathematics (Berlin, 1934; *Isis* 24, 151-3) do not include—strangely enough—any discussion of Minoan matters.

To begin with, it is well to recall the main results of EVANS' Minoan chronology, which it was possible to synchronize with the rest of the world because of the discovery of Egyptian objects in Minoan strata or of Minoan objects in Egyptian tombs.

	Crete	Egypt	years B.C. (approx.)
Early Minoan	EM I	Dyn. I-III	3400-2800
	EM II	Dyn. IV-VI	2800-2400
	EM III	Dyn. VII-XI	2400-2100
Middle Minoan	MM I	Dyn. XI-XII	2100-1900
	MM II	Dyn. XII-XIII	1900-1700
	MM III	Dyn. XIV-XVII	1700-1580
Late Minoan	LM I	Dyn. XVIII (to THUTMOSIS III)	1580-1450
	LM II	Dyn. XVIII (to AMENHOTEP III)	1450-1375
	LM III	Dyn. XVIII-XX	1375-1100

(After E. J. FORSDYKE in *Encycl. Brit.*, 14th ed., 1929, article "Crete," p. 679). The MM and LM strata are subdivided into substrata represented by letters, MM IIIa, MM IIIb, etc.

Readers interested in more elaborate synchronisms will find them in H. R. HALL : *The civilization of Greece in the Bronze Age* (294-5, London, 1928); MILES BURKITT and V. GORDON CHILDE : A chronological table of prehistory (*Antiquity*, vol. 6, 185-205, large table and 4 maps, 1932).

An early Cretan script—dating from the Early Minoan period—was purely pictographic; it is represented only by inscriptions on sealstones. There developed later, in the Middle Minoan period, a linear script which Sir ARTHUR calls the class A script, and later still, in the Late Minoan, another linear script called class B script. None of those scripts has yet been deciphered, and the language of Crete is still unknown, but there are reasons for believing that it was non-Aryan. The class A and B scripts are represented by many documents incised in clay or written with ink on pottery, stone and metal. Large hoards of clay tablets were found at Knossos in 1900.

The class A and B scripts contain signs derived from pictographs,

some of which (e.g., the life-sign *ankh*) are clearly of Egyptian origin. (See vol. 1, fig. 212 reproduced below).

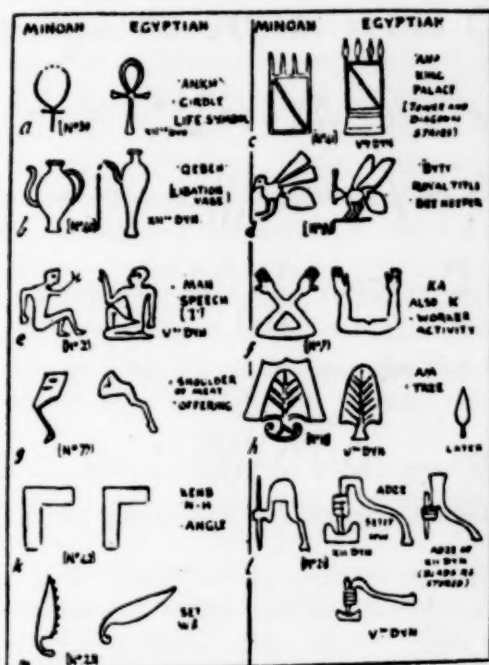


FIG. 212. SOME EGYPTIAN PARALLELS TO MINOAN SIGNS.

Half of the class B characters are also found in class A. Class A was more diffused in the Island, chiefly from MM IIIb to LM Ia, and it survived in Southern Crete at least until LM Ib. Class B was generally posterior to class A and more advanced, but not simply a later outgrowth of it. It is more probable that both were independent developments of a single prototype. Those matters are discussed in vol. 4, p. 666 ff. and there are various synoptic tables of class A and B signs in the same volume (p. 677, 684, etc.).

The earliest numerals, such as were part of the pictographic system, are represented by figure 211 (in vol. 1, 1921).

As to the later numerals, many examples are found in the documents excavated at Knossos. Most of these are assumed

to be inventories (there were immense stores of all kinds in the king's palace), and hence they contain numerals. I reproduce

UNITS —) OR | = 1;)))) OR |||| OR ||| = 5 &c.
 TENS — • = 10; :: = 40. :::: = 50; &c.
 HUNDREDS — \ OR / = 100; ||||| = 500; &c.
 THOUSANDS. ◊ = 1000, ◊◊◊◊ = 6000; &c.
 FRACTIONS — √. PROBABLY = 1/4; √√ = 3/4
 IDEAL EXAMPLE — ◊◊◊ ||||| ::)))) √√ = 3644 3/4.

FIG. 211. NUMERALS OF HIEROGLYPHIC SYSTEM.

below Sir ARTHUR's synopsis of the numerals of both classes (vol. 4, fig. 676). This is so clear that it requires no explanation.

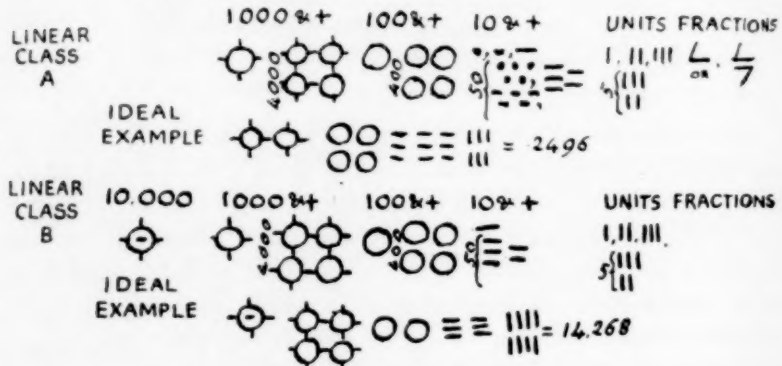


FIG. 676. NUMERALS OF CLASSES A AND B.

Though the symbols are different from the Egyptian ones, the principles of Minoan numeration in all its stages were the same as those of Egyptian numeration, and this can be explained only by Egyptian influences.

The Egyptian and Minoan systems were both decimal, but without principle of position. It should be noted however that the Egyptians of the fourth millennium B.C. had already separate symbols for seven decimal units (1, 10, 100, 1,000, 10,000, 100,000, 1,000,000) (1), while the Minoan hieroglyphics and class A stopped at the thousands, and class B at the ten thousands. The Minoan writing of fractions was also different from the Egyptian one, and distinctly more primitive. Hence Egyptian influence on Minoan culture was strangely limited, even when it was strongest. It seems to have diminished considerably after the great earthquake which took place toward the close of MM III. and to have ceased altogether sometime after the rule of RAMSES II (XIIIth century) when the Aegean world was shaken to its bottom, (not by a seismic catastrophe but by wars and revolutions), the Greek Bronze Age giving way to the Iron Age, and the Minoan power crumbling to pieces.

To return to Minoan arithmetic, its most original feature is the existence of a system of percentages. Consider the following examples (vol. 4, fig. 677, 678).

Those five tablets are obviously documents of the same kind and form. Each contains what is perhaps a proper name, followed by a statement of account in two registers. The first character in the upper register of each tablet is the "flock" sign, sometimes followed by numbers. "Sometimes, as in Fig. 677 *a*, a circle, indicating 100, represents the whole amount. More often the upper register shows a large proportion of 100 and the lower a fraction of it. These smaller amounts often follow what may be supposed to be official signs and in a principal degree the "throne and sceptre" sign. In all these cases it will be found that the upper and lower amounts specified together make up 100. A simple instance of this is given in Fig. 677 *b*, where the two sums of the upper register $57 + 23 = 80$, while in the lower register what appears to be the name of some official written in smaller letters than the initial group, is succeeded by the 'throne' sign, coupled with the barred 'flock' sign and numerals = 20 the whole sum amounting thus to 100. Here then the royal

(1) For Egyptian numerals see ALAN H. GARDINER : *Egyptian grammar* (Oxford 1927, p. 191 ff.).

share seems to have been 20 per cent. In the parallel example, Fig. 677 *c*, the two amounts in the upper register are 84 and 11 = 95, while in the lower—following a small sign-group that

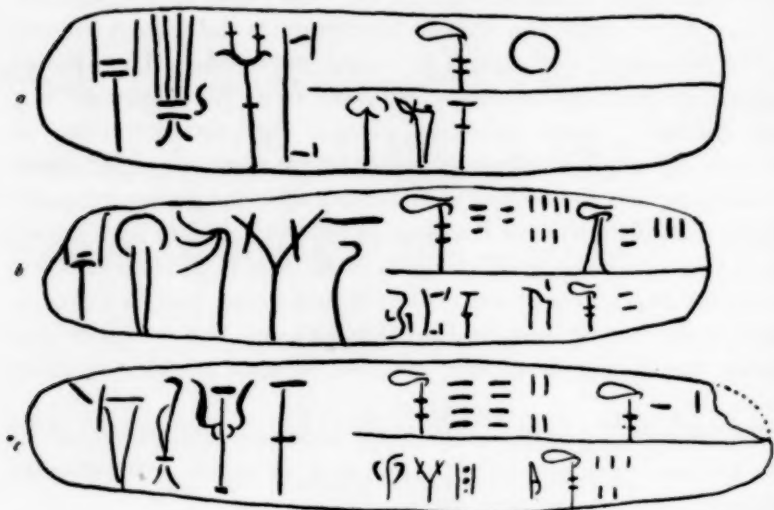


FIG. 677. *a, b, c.* 'PERCENTAGE' TABLETS.

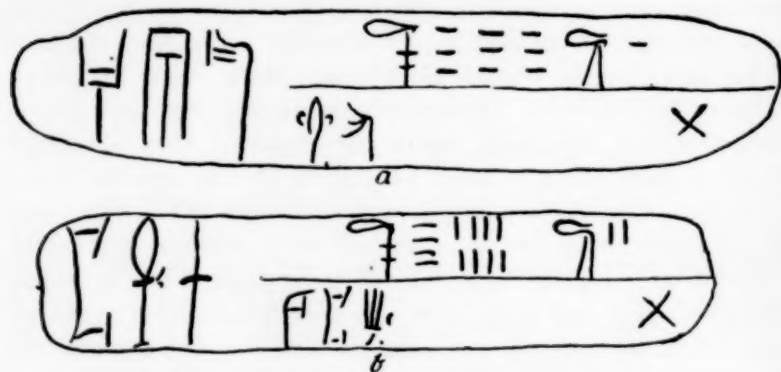


FIG. 678 *a, b.* VARIANTS OF PERCENTAGE TABLETS, SHOWING $x = 0$ IN SECOND REGISTER.

may represent the name of an official, and associated with the 'flock' sign and another sign—are ciphers = 5. Here the total again is 100, but the quota deducted is only 5 per cent. At times it sinks as low as 1 per cent. Occasionally the total amount is 50 or 200, the decimal character of the reckoning

again and again manifesting itself. A curious variety of these 'percentage' tablets is illustrated by Fig. 678 *a, b*. Here the total of the numbers indicating the round sum is contained in the first register, *a* giving $90 + 10 = 100$, *b* $48 + 2 = 50$. In these cases, therefore, the total sum dealt with is contained in the first line, and, in place of the minor percentage normally supplied in the second register, there appears, in each case, after what are probably name-groups, an *X*. It is clear that this must be interpreted not as the *x* sign of modern arithmetic, but as simply 0, since nothing was left over."

Minoan addition is well illustrated by fig. 679, which explains itself.



FIG. 679. EXAMPLE OF SIGNS OF ADDITION.

In addition to the *Palace of Minos*, consult also "*Scripta Minoa*, the written documents of Minoan Crete. With special reference to the archives of Knossos, Volume I : The hieroglyphic and primitive linear classes, with an account of the discovery of the pre-Phœnician scripts, their place in Minoan story and their Mediterranean relations" (Oxford, Clarendon Press, 1909), by the same author. This suggests that Miss EVANS would perhaps be well advised to extend her index to all the Cretan publications of her illustrious brother. To conclude, I beg to thank Sir ARTHUR for having so graciously authorized me to reproduce the various figures illustrating this article.

October 22, 1935.

GEORGE SARTON.

More Medieval Color-Making :

TRACTATUS DE COLORIBUS

from MUNICH, Staatsbibliothek, *MS. Latin 444*

The *Tractatus qualiter quilibet artificialis color fieri possit* from Paris, Bibliothèque Nationale, *MS. Latin 6749b*, foll. 61 r.-62 v. (1), contains less information than its title promises. In editing it, I remarked that it 'probably represents an abridgment of a longer work.' (2) This opinion has been substantially justified by the discovery of a fuller version in Munich, Bayerische Staatsbibliothek, fourteenth-century *MS. Latin 444*, here referred to as the 'Munich *Tractatus*,' which provides a link between the thirteenth-century Caius College *MS. 181 Appendix* (3) and the fifteenth-century texts in Paris *MS. Latin 6749b* (4) and Bologna, R. Biblioteca Universitaria, *MS. 1536* (5); and adds both substance and clarity to the Paris *Tractatus*, which it most closely resembles. It is probably safe to assume that the Munich text represents a version of an original *Tractatus qualiter quilibet artificialis color fieri possit* (from which the Paris text was an abridged transcript), though its title, found only in the *explicit* (6), is simply *Tractatus de coloribus*.

(1) Ed. D. V. THOMPSON, Jr., "Medieval Color-Making," *Isis*, 22 (1935), 456-68. Two further associations of the Paris *Tractatus* may be pointed out : 1) with Paris *MS. Latin 7400 A* in which fol. 51v, col. 2, 52r, col. 1, 'Assisia auri vel deauratio levis' is closely equivalent to § XX of the Paris *Tractatus*; and 2) with Cambridge, Gonville and Caius College *MS. 413*, in which a version of § XV of the Paris *Tractatus* occurs at fol. 104v. No doubt there are other points of similarity among the texts of this fairly large group.

(2) *Ibid.*, p. 459.

(3) Ed. D. W. SINGER, "MICHAEL SCOT and Alchemy," *Isis*, 13 (1930), 5-15.

(4) *Ed. cit. supra*; referred to below as the "Paris *Tractatus*."

(5) Published by Mrs MARY PHILADELPHIA MERRIFIELD as *MS. S. Salvatore 165* in her *Original Treatises...* (London, 1849), and re-edited as "Il Libro dei colori," *Disp. 222*, in the ROMAGNOLI *Scelta di curiosità letterarie inedite o rare* (Bologna, 1897).

(6) Fol. 217 v., col. 1.

That the author, or at least the scribe, of the Munich *Tractatus* was German is sufficiently demonstrated by a passage in fol. 214 v., col. 1 (§ 3) referring to certain *lapides fluviales albos... quos kiselsteine vocamus*.

The Munich *Tractatus* can be described in terms of the published text of the Paris *Tractatus* as far as the two recensions coincide. Where the Munich *Tractatus* contains whole sections (numbered §§) not found in the Paris *Tractatus*, these sections are printed here *in extenso*; likewise, note is taken of readings where the Munich *Tractatus* departs from the Paris *Tractatus*. In citing variants, orthographic differences have been left out of consideration, and minor alternations of word order and syntax (such as ablative for accusative after *imponere*, or genitive for *de* with ablative) have been ignored. Synonymous expressions such as *videlicet*, *scilicet*; *forsan*, *forsitan*; *dictum*, *predictum*; *serua*, *reserua*; *accipe*, *recipe*; *post*, *postea*; *et*, *atque*; *sive*, *vel*; etc., are not noted. (7) Reference to my edition of the Paris *Tractatus* is made by Roman numerals, which indicate the section, and Arabic numerals, which denote the printed line within the section.

Tractatus, Munich MS. Latin 444

[1]

Fol. 214 v. incipit 'De cerusa componenda.' This section corresponds with § XVII of the Paris *Tractatus* except as follows:

§ XVII. 1 conficienda] componenda. 4 bene... uno] vel salsam in potu vel vase terreo. 6 *om.* Inveneris album. 7 ut... fimo] et nota quod de laminis ferreis potest croceus fieri modo predicto faciendo. (8)

[2-10]

After this initial recipe follow nine paragraphs (numbered 2-10 below) not found in the Paris text. They may be independent of the *Tractatus* archetype; for in the Munich manuscript,

(7) Words occurring in the Paris *Tractatus* and lacking in the Munich version are indicated as omissions in the latter, though they may in fact be interpolations in the former.

(8) This reference to a yellow prepared from iron is highly exceptional in a medieval work dealing with colors for use as pigments.

fol. 215 r., col. 2, where the correspondence of the two recensions begins again, a perceptible change in the script may be observed, and the 'N' of *Notandum* (section 11, below) is marked for rubrication by a minuscule in a blank space. For the sake of completeness these nine paragraphs are reproduced here, though they may not have been present in the archetype.

[2]

De suffusione cristalli et eius triplici tinctura. Prius bene inter prunas ignatur, et post in aceto extinguitur; et terratur subtiliter, et apponatur de cerusa et de sanguine vitri ad tertiam partem ipsius. Post fundatur in crucibulo inter brunas ardentes igne acerrimo in clibano vitreariorum, vel in fabrica cum follibus ventilendo. Quo infuso, vas forma ad placitum, ut de vitro. Quia si ipsum aliquo colore colorare volueris, hoc modo facere poteris: quod si in colore persico, impone azarum transmarinum afinatum post quam fuerit fusus; quia si ipsum in colore ru<bro> volueris, hoc fac de minio, etc. Si in colorem viridem, hoc fac de flore eris vel viridi greco. Et scias quod omni colore quo coloratur vitrum potest colorari cristallus; in omni colore, dico, ignem sustinente.

[3]

De perlis atque margaritis componendis. Recipe lapides spericos in capitibus piscium repertos lucentes, aut lapides fluviales albos et lucentes ad modum cristalli, quos kiselsteine vocamus, quos in subtilissimum pulverem redactos distempera cum succo limacum, terendo in lapide mar<moreo> ut fiat ad modum paste durum. De quo protrahe formulas ad placitum magnas vel parvas; seta porci perforatas pone in pilo de cauda equi, et decoque in pane ordeaceo in furno de coquendo, aut in pastillo inter carnes bovinas. Post ultimo decoque per horam modicam in ventre columbarum iuvenum.

[4]

De margaritis componendis. Recipe vitrum cuiuscumque coloris [*MS.* colore] volueris, et ipsum redige in subtilissimum pulverem; quem distempera cum succo limacis, eum terendo in lapide marmore ut fiat ad modum paste [*fol.* 214 v., col. 2] dure. De

qua fac formulas parvas, protrahendo inter digitos oleo inunctos, quas seta [MS. sera] porci perforatas pone in filo cupreo et tene super prunas ardentes in fornem per foramen aliquod. Quas bene ignitas, extingue equandas in calaturo thuris. Post lava in aqua pura, et terge mundo panno.

[5]

Quia si ebur vel ossa vel ligna vel fila aliquo colore colorare volueris, primo per horam bulliant et iaceant in aqua aluminata, et desiccantur bene. Post habeas bonum bresiletum subtilissime rasum pulverizatum, et fac bullire in aqua pura vel lexivio; et in tali decoctione bresileti bene calida pone ista, ut bene mergantur. Post remove, et ad umbram desicca; et hoc fac reiterando donec sufficiant. Quidam decoquant bresiletum in aqua, et fit color rubeus; quidam in lexivio, et fit purpureus. Quidam vero colorant rem colore croceo, postea in decoctione bresileti; et sic res melius coloratur, fitque pulchrior si volueris cum rebus iam dictis; et sic optime fiunt ossa colorata rubea.

[6]

Quia si predicta viridi colore colorare volueris valde pulcro, iaceant primo in aqua aluminata vel bene imbibantur. Post accipe viride grecum, et ipsum distempera aceto acerrimo ita ut si liquidum; et impone parum de sale armoniaco, et de laminis cupri, et ipsam rem colorandam; et pone in vase cupreo vel quercino bene opturato, in quo pone predicta ossa vel ligna. Post pone sub fimo equi calido et humido per 17 dies vel amplius, et erunt optime colore viridi colorata.

[7]

Quia si nigro colore volueris colorare, accipe gallas minutim confractas, et ipsas in bono aceto bulli cum predictis rebus. Post cola decoctionem, et pone ibi vitriolum et succum nucis maioris, et iterum in illis bulliant res predictae.

[8]

Ad faciendum aurum cum quo scribitur. Recipe argenti vivi 3 i [fol. 215 r., col. 1], stagni 3 i, salis armoniaci 3 i et parum plus. Fundatur primo stagnum, et cum ipso misceatur argentum

vivum, et terribile terantur ergo ista si vis super lapidem ita quod totum unum corpus fiat. Postea habeas unum urinale in quo illud ponas; et habeas unam ollam in qua cineres cribellatas pone; et in eis colloca urinale ita quod totum cooperiatur cineribus usque ad collum; et non cooperiatur urinale antequam humiditas exalaverit. Et fac primo lentum ignem, et postea aliquantulum augmenta quousque tota humiditas exiverit. Tunc obturatur urinale cum aliquo panno lineo, continuando a mane in estate usque ad horam 14, et erit completum. Postea frange urinale, et illud quod inveneris in fundo ad colorem tuum reserva, quoniam habebit aureum co<lorem>. Illud distempera cum urina cocta, in qua dissolvatur gummi arabicum $3 \frac{1}{2}$, et tunc refrigerata urina erit rubea et clara, cum qua distempera colorem tuum in cornu, et scribe inde proculdubio. Resultat color egregius, et quanto antiquius, tanto melior erit. Cum autem scribere volueris, move in cornu cum baculo sicut movitur minium. (9)

[9]

De modo componendi vermilionem. Recipe libram 1 argenti vivi et mediam libram vel tertiam partem sulphuris vivi. Primo fundas sulphur in pulvere redactum in patella terrea bene vitreata; quo fuso et ab igne deposito, impone argentum vivum, bene insimul incorporando ne apareat. Post abstractum pulveriza, et pone in vase terreo interius plumbato, vel in vase sublimatorio ad hoc facto, ut in ampulla vitrea, decoquendo lento igne carbonum donec humiditas consummetur; et post igne acriori foramine clauso donec spiritus [*fol. 215 r., col. 2*] sublimetur, quod scitur colore ru<beo>fumi. Set nota quod debes accipere ii partes argenti vivi et unam sulphuris vivi. Postea habeas aliquam ampullam de vitro, et pone totum intus, ita quod sit plena. Post habeas fornacem de lapidibus, inferius strictam, et desuper amplam; et sint due virge ferree desuper. Tunc colloca ollam tuam super virgas et fac subtus ignem clarum de lignis siccis, et sit ignis semper lentus. Tunc videbis flammam desuper, et audies frangorem interius;

(9) Despite its circumstantial detail, this recipe is defective; for the essential ingredient, sulphur, is omitted. Compare § 10, below, and for *Aurum musicum* in general see D. V. THOMPSON JR. and G. H. HAMILTON, *De arte illuminandi, The Technique of Manuscript Illumination* (New Haven: Yale University Press, 1933), pp. 37, 38, n. 50.

et quando fundus clarescet quia nihil in fundo remanebit quin ascendat ad os ampulle, quoniam flamma penitus cessaverit, et fundus erit vacuus, et flammæ non exhibit, tunc habeas unam parvam tegulam, et tege de illa os ampulle, et facias magnam ignem, ita quod videritur quod ampulla tota fundatur. Tunc dimitte ignem per se infrigescere, et extingue calorem donec ad crastinum. Post accipe ampullam, et invenies circa os ampulle quod queris.

[10]

Ad faciendum aurum musicum. Recipe ii 3 de stagno, et funde; et proice desuper 3 i de mercurio. Postea pulverizetur fortiter, et adde 3 1/2 de sulphure vivo pulverizato, et 3 i de sale armoniaco trito; et iunge omnia simul, et pone in urinale, et ad ignem pone in olla plena [*MS.* plana] cineribus cribratis. Et fac ignem per totam diem. Et cum infrigidatum fuerit, invenies aurum musicum cum quo poteris scribere sicut cum incausto; set non debet teri, set ponatur in cornu et distemperetur cum albo ovorum colato per spongiam.

[11-20]

At this point the sequence of numbered sections of the Munich *Tractatus* begins to agree with that of the Paris *Tractatus*. §§ II-XI of the Paris *Tractatus* correspond to §§ 11-20 of the Munich *Tractatus*, with the following exceptions (§ I of the Paris *Tractatus* is purely introductory, may well be a fifteenth-century embellishment, and has no counterpart here):

§ II [11]. 2 artificiale. Naturale duplex, scilicet. 3 ipsorum duplex est affinatio, scilicet per pastellum et capitellum.

§ III [12]. 1 ante Transmarinum *add.* Per pastellum. 3 teritur subtilissime cum aqua et sale in lapide profirico. Postea desiccatur et pulverizatur. 4,5 patella... ipsum] pastillo ipsi. 6 baculo ut] b. agitato diu in vase ligneo ut. 7 viridis] indici. 8 ferrea] terrea.

§ IV [13]. 1 tendat] tendens. 4 *om.* vero. 5 colorem et impondus ipsius azurii augmentat.

§ V [14]. 1 *om.* sic fit. 2,3 collofonie libram sive de resina colata libram unam, quater tantum de sepo. 5 ceram virgineam et sepum in vernicem in patella. 6 resinam et ultimo pulverem; *om.* tunc. 7 spissum satis fuerit. 8. Q. v. tunc cola.

§ VI [15]. 1,2 mastice, colofonia, et verniza componunt predictum pastellum. 2 aliis iam dictis.

§ VII [16]. 1 *om.* etiam. 1,2 predicti pastilli. 4 libre debet imponi libra una.

§ VIII [17]. 1 Quomodo... citramarinum] Nunc. 2 a. ep [*sic*] et per. 4 extrahitur] extrahi posset a; capitello vel s. r. 5 citramarinum scilicet de alemannia. 6, 7 vel de hyspania seu de l. et affinatur. 10 et] post. 11 bullire permittite, movendo c. s. atque cum penna spumam deponendo. Post p. 12 invenies] reperies. 13, 14 v. p. et postea pluries leves [*lege laves*] aqua pura calida atque frigida ut auferatur ab ipso viscositas saponis et etiam p. p. l. tociens colebis donec totum habeas pulchrum et affinatum.

§ IX [18]. 1 Notandum autem q.; *om.* ab alio. 2, 3 in p. resolutam] pulverizata. 4 Si] Quod si; colorem est o. et transmamarinum. Si vero tendit. 5, 6 ad n. vel pallorem, allemanicum, et p. valens; si vero ad a., tunc artificialiter est factum, et abiciendum.

§ X [19]. 1, 2 Alio modo cognosci poterit azurium transmamarinum. Ponas ipsum in manu tua aut in s. 3 si erunt. 4 manus aut scutella bone [*sic*] ipsius azurii valde pulchre, bonum est.

§ XI [20]. 1 S. et aliqui d. 3, 4 est... examinando] potest, videlicet in fundo cum cultello parum apperiendo sacculum et illud extrahendo sicut prius.

The Munich *Tractatus* has no sections corresponding to §§ XII and XIII of the Paris recension; in their place we have the following brief direction, interpolated before Paris § XIV = Munich § 22.

[21]

Si vis dare colorem azurio, pone rasuram [*fol. 216 r., col. 1*] de brassilio in aqua frigida fere per diem. Postea cola et in illa aqua pone azurum, et recuperabit colorem.

§ XIV [22]. 1 Modus... bonus] Ad faciendum autem azurum artificiale. 2, 3 quantas v. et suspense super a. a. in vase terreo vel c. e. 4 superpone] subpone; calido et humido p. d. 5 flos azurii v. p. et si vis reitera et sicut ponitur sub fimo, sic potest poni sub <u>vis compressis que proiecte sunt de torculari.

The Munich *Tractatus* next exhibits seventeen sections (§§ 23-39) not found in the Paris recension. (With Munich § 40 = Paris § XV agreement is again established.)

[23]

Ad idem. Recipe cerusam ablutam et candidam, unam partem, et duas partes indici. Insimul tere. Si vero pari mensura miscueris, erit flavum azurium, vel tendens ad colorem talem. Auge vel etiam minue sicut vis, ut melius appareat.

[24]

Item. Nota quod azurium de Monte Ario vel de Massa incoloratur [*MS. icorilatur*] cum indico de Balgadea, hoc est cum flore indici, et vilioratur cum pinguedine ceruse; et cum aqua viridis eris misce, et azurio da bibere; et si satis habuerit, nullam peritus probationem timet.

[25]

Lexivium ad purificandum azurium sic fit. Accipe cineres vinit [*sic*] et ponas in cacabum cum aqua et calce viva, et bene moveas. Dimitte residere per duos dies, et tunc extrahas lexivium clarum quo supernatat; et factum lexivium bene predictos cineres facias transire; et tunc erit bonum et forte. Et cum isto lexivio lavabis purum, permittendo ipsum residere in predicto vase vel patella, et subtrahendo lexivium successive sicut dictum est de aqua, tandem siccata cooperto panno, et siccatum pulverem reserva ad opus tuum.

[26]

Si inveneris lapidem lazuli, elige melius coloratum, et eice album [*fol. 216 r., col. 2*], et frange cum martello super incudem. Postea pista in mortario eneo cum aqua calida. Postea move super marmorem cum aqua salsata quousque sit quasi vinum. Postea desicca ad solem, vel ad ignem, quousque pasta sit dura. Postea fac pastillum : ad unam libram minere, unam libram de pastillo. Accipe colofonie 3 vi, resine 3 ii et 1/2, masticis 3 i; classe, olibani, ere albe, ana 3 i; olei de lino 3 iii. Et pone primo oleum in unam ollam mundam ad ignem lentum. Postea ceram postea pulveriza masticem, classam, et thus; et pone in ollam; postea resinam et colofoniam; et deduc donec sit totum insimul corporatum. Post habeas aliquod vas de ligno, et unum baculum grossum; et deduc in illo vase cum baculo, et iacta desuper parum de aqua tepida; et deduc quousque videris aquam

lividam. Cola illam in aliquod vas mundum per pannum. Postea iacta de aqua magis calida, et ita facias quamdiu videris exire aquam lividam. Postea habeas lexivium simplex, et extrahe similiter cum illo lexivio calido. Postea cum lexivio facto de cineribus et calce ita facias donec sit totum abstractum. Post dimitte quiescere usque ad aliam diem. Post eice illam aquam et azurium remanebit in fundo vasis. Postea lexivium habeas, et pone in patellam unam cum illo azurio, et dimitte bullire fortiter super ignem, et exspuma cum una penna et serva. Spuma etiam bona est ad ponendum in pastillum. Post depone ab igne et sine quiescere; et eice illud lexivium. Post ablue cum aqua clara et cola per pannum album; et eice illa(m) aquam et exsicca ad solem vel ad ignem, et est factum.

[27]

Item. Sic etiam potest fieri azurium. Accipe ampullam puri cupri, et pone in ea calcem usque ad medium, et imple eam fortissimo aceto, et cooperi et sigilla; et pone sub fimo calido, et dimitte usque unum mensem. Postea aperi, et invenies. Set hoc non valet nisi pictoribus in pariete, etc. (10)

[28]

Sequitur de viridi. (11) Notandum est ergo quod multiplex est viride, scilicet viride grecum et sæsum [fol. 216 v., col. 1] et cetera. Videamus [MS. virideramus], ergo, primo de viridi

(10) This is a variant of a rule from the *De coloribus et mixtionibus* family. (See THOMPSON and HAMILTON, *op. cit.*, p. 29, n. 26.) Versions so far published occur in Sir T. PHILLIPPS, "Letter... communicating a transcript of a MS. Treatise... entitled Mappae Clavicula," *Archaeologia*, XXXII (1847), 183, from MS. Phillipps 3715 (in the possession of T. FITZROY FENWICK, Esq., Cheltenham); in R. HENDRIE, *An Essay upon Various Arts* (London, 1847), p. 422, from MS. Harley 3915; in two divergent forms from the *Liber diversarum artium*, Montpellier, École de Médecine MS. 277, in *Catalogue général des MSS. des bibliothèques publiques des départements*, I (Paris, 1849), 744, 745; in D. V. THOMPSON ed., "*Liber de coloribus* from Sloane MS. 1754," *Speculum*, I (1926), 292; and in M. P. MERRIFIELD, *Original Treatises*, *cit. supra*, I, 137, § 170 in the *Liber Magistri Petri*, Paris MS. latin 6741. This recipe, in the form found here, is widely distributed through medieval writings on experimental chemistry. It is often associated with other chapters of the *De coloribus et mixtionibus* group, but seems to have circulated also independently, and to have given rise to many written formulas differing slightly in form and content.

(11) The following eight sections supply one of the most conspicuous deficiencies of the Paris *Tractatus*. See my "Medieval Color-Making," *cit. supra*.

greco nobiliori, quia sic fit. Recipe laminas purissimas cupri, et rade ut sint munde et clare. Postea asperge aceto fortissimo, et suspende in aliquo vase terreo vel ligneo ubi sit acetum forte; et pone ita quod acetum non tangant, et tege valde bene, ut nihil vaporis exeat, et pone in aliquo proiecto calido, ut ponente in illo quod prohibetur a torculari vel in sterquilinio equorum; et dimitte stare sic per 24 dies. Postea venias ad vas tuum et detege; et quod invenies, super tabulas rade, et exsicca; et est optimum viride. Et iterum postea predictas tabulas asperge ut prius, et hoc reitera tociens quousque satis habeas.

[28a]

Viride salsum sic fit. Accipe mel et decoque bene; quo decocto, asperge de eodem tabulas purissimas cupri rasas. Postea pulveriza eas bene sic. De isto autem viridi magis fit insimul quam de alio. Verumtamen illud melius est et subtilius.

The next two sections (§§ 29, 30), as well as § 41, below, are familiar in another context: the *Schedula diversarum artium* of Theophilus Presbyter. Relationships of this sort cannot yet be adequately accounted for, or studied profitably in isolated examples. The constitution of the *Schedula* and the sources and distribution of the matter contained in it call for investigation which will involve scores of manuscripts besides the German Latin congener, the Munich *Tractatus*, under consideration. (12)

[29]

Aliud. De viridi salso. (12) Sume lignum quercinum quante latitudinis et longitudinis volueris, et cava illud in modum scrinii. Deinde tolle cuprum, et fac illud circomari in laminas quante latitudinis vel longitudinis volueris, ut tamen longitudo eius cooperiat longitudinem ligni concavi. Postea accipe scutellam plenam salis, et comprimes eum fortiter in igne; et cooperi carbonibus per noctem; et in crastino tere fortiter super lapidem, siccum. Tunc accipe furculas graciles et colloca eas in predicto ligno concavo ut due partes concavi inferius sint et tertia superius;

(12) See THEOPHILUS, *Schedula diversarum artium*, I, XLII, ed. A. ILG (Vienna, 1874), pp. 87-89. For the nationality of THEOPHILUS, see my article, "The *Schedula* of THEOPHILUS PRESBYTER," *Speculum*, VII (1932), 207-209.

sicque illinias laminas ex utraque parte melle. Postea asperge sal tritum et collocabis super furculos illos, coniunctim cooperiens diligentissime altero ligno ad hoc apto, ita ut nichil spiraminis exire possit. Postea fac foramen cum crebello in angulo ipsius ligni per quod possis infundere calidum acetum aut urinam pueri calidam, ita ut tertia pars eius impleatur; et mox obstrue foramen illud, et lignum pone ut [fol. 216 v., col. 2] possis sterquilinio cooperire ex omni parte. Post 4 septimanas solve coopericulum, et quicquid super cuprum inveneris abraide et conserva; et iterum repones. Cooperi eo ordine quo prius.

[30]

Si vero viride hispanicum facere volueris (13), tolle cupri tabulas attenuatas et radens eas diligenter ex utraque parte, perfunde acceto calido absque melle et sale, componesque eas ut prius in ligno minore concavo, ordine quo supra. Post 9 ebdomadas expone et rade. Sic facias donec tibi sufficiat.

[31]

Si vis facere alio modo, sume laminas de cupro, et unge eas bene cum sapone. Postea pone eas in potto novo, et imple pottum aceto, et cooperi, et pone in loco calido, et dimitte ibi per 24 dies. Postea aperi et rade tabulas sive laminas illas super tabulam planam, et dimitte siccari. Et illud vocatur viride romanicum. (14)

[32]

Item. Alio modo fit color viridis. Cuprum mundissimum [sub]limabis et in subtilem pulverem redigas; quem in vase cupreo vel metallico mittas, cui vinum superinfundas, ignique superponas, ut bulliat. Et cum satis viride fuerit, tolle, et refrigerari permitte,

(13) See *Schedula*, I, XLIII, *ed. cit.*, p. 89.

(14) *Romanicum* is not the name usually given to this green in medieval writings: *Rotomagense* is the title (subject to scribal corruption) by which it is known in the manuscripts of the *De coloribus et mixtionibus* family (see n. 10, above) and in the *Secretum philosophorum*. For lists of the chief known manuscripts of the latter, see LYNN THORNDIKE, *History of Magic and Experimental Science* (2d ed., New York: MACMILLAN, 1929), II, 811, 812; and D. W. SINGER, *Catalogue of Latin and Vernacular Alchemical Manuscripts*, II (Brussels: U.A.I., 1930), 722-724, art. 1078. (The recipe for "Rouen Green" occurs in Section I, *Grammatica et de eius coloribus*.)

extrahens illud, et reponens pulverem siccum ut prius. Et sic poteris facere quantum vis.

[33]

Item. Alius modus ad viride grecum. Recipe laminas cupreas quanto plures habere possis, et ipsas sale armonico in melle dispumato resoluto inmittas. Suspende locatos in vegete super acetum aut super urinam puerorum bene distillatam, ac etiam salsatam, in potto aliquo cupreo bene opturato filtro, sub fimo equino potto posito per xiiii dies vel amplius. Et colligetur circa illas tabulas flos eris viridis valde pulcher.

[34]

Alibi [*fol. 217 r., col. 1*] dicitur : perunge laminas cupri vitellis ovorum, et asperge sal commune; et suspende ut prius.

[35]

Ad idem, modus alius quem casualiter inveni. Accipe de tartaro pulverizato vini albi libram i, salis communis libram $\frac{1}{2}$, salis armoniaci 3 ii, vitri combusti aut calcis ovorum aut gipsi aut calcis marmoris libras 3; que in subtilissimum pulverem redacta distempera cum aceto acerrimo vini albi et aliquantulo mellis; et interpone laminas cupri quam plures in scutella vel ligno quercus vel vase cupreo bene opturato; et expone calori solis aut sub fimo calido equino per dies aliquos, et habebis colorem mirabiliter pulchrum.

[36]

Item. Coniunge indicum distemperatum cum auripigmento distemperato; et hiis duobus livido et croceo resultabit inde pulcherrimus color; et hoc ego sepius vidi.

[37]

Sequitur de vernitio albo. Accipe de glassa partem unam et 2 partes olei canabini aut lini aut nucum; et habeas 3 pottos terreos novos in quorum uno ponas oleum, et sic mitte ad ignem lentum ut bulliat paulatim. Postea recipe glassam et pone in alio, et recipe tertium pottum et pone illum super pottum qui

continet glassam, et [pone in alio] os illius potti sit inferius. Et luta unum pottum ad alium, et sic pone super ignem lentum quousque glassa f[r]undatur. Deinde habeas virgam ferream, et mitte in vas illud, et move, et extrahe; et si in extractione videris crustulas super virgulam iacentes, signum est quod adhuc non est bene fusa; et si non videris aliquid nisi mundum et clarum, signum est effusionis sufficientis. Hoc facto, recipe pottum in quo est oleum, et funde in pottum glasse per suum foramen parvum, et induc fortiter cum baculo; et [fol. 217 r., col. 2] augmenta ignem tuum per spatium unius hore vel tantum quod 7 psalmi [MS. spalmi] possent dici. Et si flamma exeat a poto, obstrue foramen eius cum panno lineo medefacto. Postea depone ab igne et pone liquorem in alio vase; et sic servare poteris quamdiu volueris et vendere pro optimo vernitio.

[38]

Est quidam alius color qui vocatur verniza, qui superponitur omnibus aliis coloribus; et est nobilior omnibus, quia splendorem facit, et durat semper; et preservat a pluvia et a vento; et fit in hunc modum. Recipe libram i glasse albe in pulverem redacte, quam ponas in vase terreo vernizato vel plumbato et ignem sustinente; et superpone aliud vas in fundo foramen habens, ita ut ferrum longum cum manubrio possit intrare et bene conglutinatum undique pasta, et pone super tripodem ad ignem carbonum non dantem flammam; et move semper cum spatula donec fundatur glassa. Qua fusa, impone coclear plenum de oleo calidissimo lini vel canabi, semper movendo. Sic oleum paulatim imponendo, ultimo pone totum. Probatio autem decoctionis. Recipe parum cum ferro, et pone super cultellum; et si filum faciat tunc ab igne depone, et aliquantulum infrigidari (MS. infrandari) permitte. Post cola per pannum, et serva. Et nota quod due partes de oleo, et tertia de glassa, debent poni.

[39]

Est etiam alia verniza que non est alba ut predicta, et est aliquantulum crocei coloris, et non adeo bona, nec ita caro, que fit de ambra in hunc modum. Recipe pulverem ambre subtilissimum, et ipsum incorpora cum oleo lini vel canabi ut fiat ad modum paste durum vel aliquantulum liquidius. Post pone in potto uno

superposito alio potto in fundo perforato, ut iam dictum est; et decoque lento igne carbonum, et fiant omnia per ordinem ut iam dictum est. Et ista verniza utendum est [*fol. 217 v., col. 1*] in grossis operibus, puta in muris et parietibus, set prima valet in sellis, clipeis, et ymaginibus, etc.

Munich *Tractatus* § 40 = Paris *Tractatus* § XV with the following exceptions :

§ XV [40]. 1 De... Accipe] Color aureus lombardicus sic fit. Accipe. 2 marmoream. 3 vitri] nitri *corr. ex vitri*: v *exp.*, n s.s. 4 aceti... terendo] modicum aceti et t. 5, 6 scribe... permitt[e] s. quod volueris.

The remaining sections of the Munich *Tractatus* have no equivalents in the Paris *Tractatus*. § 41 is a version of the opening chapter of the *Schedula* of Theophilus. (15)

[41]

Sequitur de membrana, que est color quo pingitur facies nuda et nuda corpora. Sic compositur. Tolle cerusam, illud album quod fit de plumbo, et pone eam non tritam set ita ut est siccam in aliquod vas cupreum vel ferreum; et pone super prunas ardentes, et combure donec convertatur in flavum colorem. Deinde tere, et admisce albam cerusam et zenobrium donec carni simile fiat; quorum colorum mixtura in tuo sit arbitrio, ut si faciem rubeam velis facere, adde cenobrium; si vero candidas, addi candi, id est albi, et sic de singulis.

[42]

Si vis deaurare pelles aut laminas, recipe fel bovinum in quo dissolve crocum ytalicum. Post superpone ipsis prius cum aliquo planatino bene planatis, et cetera.

[43]

Nunc dicendum est qualiter fiat tenta, que est color miser visu; cum tamen de ipso liniuntur scutelle argentee vel stagnee, inducit colorem aureum valde pulchrum. Et fit in hu<n>c modum. Accipe libram i de glassa pulverizata, et libram i et dimidiam

(15) *Ed. cit. supra*, pp. 13-15.

de aloe caballino; que in pulverem redacta pone in vase aliquo, interius bene plumbato, cui superpone aliud vas in fundo foramen habente, et dissolve ad ignem ut supra dictum est de verniza. Post oleum infunde bene calidum, semper cum spatula incorporando, atque modo post proba et cola per pannum lineum, etc.

Explicit Tractatus de coloribus.

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A Note on Concepts of the Inferior Planets in the Early Middle Ages

HERACLIDES' concept of the planetary system, known to be the starting point of COPERNICUS' reasoning, was transmitted to the Middle Ages through the works of MARTIANUS CAPELLA (1) and CHALCIDIUS (2) and possibly MACROBIUS (3). The theory was that Venus and Mercury described their orbits about the sun. But, to date, the only attention it is known to have attracted is that of JOHN SCOTUS (4) and WILLIAM OF CONCHES (5), both of whom adapted the idea to their own purposes (6). That these were not the only students to adopt the concept in some form is evinced by two manuscripts I have recently examined in photostatic copies (7).

Codex Mellicensis 370, of unknown provenance (now in the Benedictine monastery at Melk, Austria) (8), contains the scientific writings of BEDE with commentary and tables. The text of BEDE's *De Temporum Ratione* is written in Carolingian miniscule of the middle-ninth century. The commentary and interlinear glosses

(1) *De Nuptiis Philologiae et Mercurii* (ed. EYSENHARDT), 8.857.

(2) *Platonis Timaeus Interprete Chalcidio* (ed. WRÖBEL), pp. 176-7.

(3) *In Somnium Scipionis* (ed. EYSENHARDT), 1.19.

(4) *De Divisione Naturae* 3.27 (*Patrologia Latina* 122.698).

(5) *Elementi Philosophiae* 2 (*Patrologia Latina* 90.1146).

(6) PIERRE DUHEM (*Le Système du Monde*, III, 76-87, 111-2, 125) has tried to maintain that this system was adopted by PSEUDO-BEDE, *De Mundi Constitutione* (*Patrologia Latina* XC, 889-895) and "perhaps" by HONORIUS OF AUTUN [?], *De Solis Affectibus* (*Pat. Lat.* CLXXII, 111-2). His interpretation of HONORIUS is untenable and has nowhere been accepted. DREYER has refuted his assertions about PSEUDO-BEDE (*Studies in the History and Method of Science*, ed. SINGER, II, 105-108).

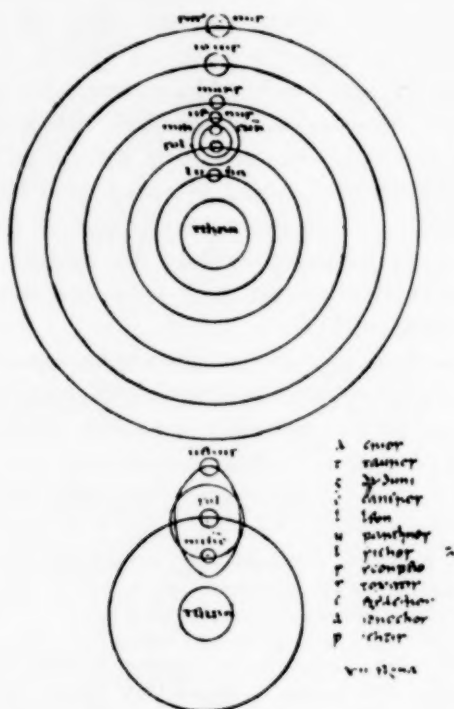
(7) The Melk manuscript was procured through the courtesy of Dr. WILHELM SCHIER by a grant from The American Council of Learned Societies. Photostats of the Karlsruhe MS. are in the Oberlin College Library.

(8) No. 6 in KROPFF, *Bibliotheca Mellicensis* (Vienna, 1747), pp. 18-19; No. G 32 in the table of contents of the manuscript, written in a modern hand.

are in another hand, possibly somewhat later. On p. 35 (marked 35 v.) the commentator writes :

Ideo hae due stellae numquam amplius a sole recedunt quia circa solem circuli earum sunt et circularum suorum in sole ponunt centrum. Curvatura ergo absidum eas amplius ire non promittit quoniam non habent longitudinem ad solem. Ergo reciprocantur a longissimis distantiae suae finibus. Superiores autem stelle ideo in longum tendunt quoniam circuli earum circa terram sunt.

It is obvious that the commentator has used CAPELLA, whom he paraphrases, sometimes *verbatim*.



The famous Karlsruhe manuscript, *Reichenau* 167 ("The Karlsruhe Bede") is written in an Irish hand, A.D. 836-48, possibly at Perrona Scottorum (9). The text contains BEDE's scientific works, tables, and chronicles and is primarily of interest for its Irish glosses and annals. On folio 16 r. is a diagram, here reproduced, that has escaped comment. It immediately

(9) J. F. KENNEY, *Sources for the Early History of Ireland* 1. 670.

follows the Dionysiac Easter cycle, A.D. 532-1063, and precedes a calendar. There is no commentary. The upper diagram is intelligible enough; but the elliptical orbit of Venus in the lower diagram presents difficulties. Since the astronomical knowledge displayed in the manuscript is not of exceptionally high order, it would appear that the scribe is giving a simple, but not very satisfactory, explanation of an observed phenomenon, possibly the fact that Venus, although it wanders further from the sun in the zodiac than does Mercury, is nearer the sun at the evening setting. According to PTOLEMY (10), the observation is Venus $5^{\circ} 40'$ and Mercury $11^{\circ} 30'$. The diagrams do not accord with the text, for the verses on the zodiac (f. 13 v.) give the accepted order. Nor is there an explanation for the list of zodiacal signs accompanying the diagram, made up as it is partly of Greek and partly of Latin names. This list is a duplicate of one on f. 12 v. Some knowledge of Greek is evinced by the author of the manuscript elsewhere, but it will be noted that the names given here are quite corrupt.

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(10) *Magna Constr.* 8.7.

„Dynamidia” in medieval medical literature

During the Middle Ages the term *dynamidia* (meaning the virtues of medical substances or treatments) enjoyed a technical significance and usage that it has not had in earlier and later ages. Many other medieval expressions, for instance, *herbaria*, *antidotaria*, *receptaria*, *dieta*, *butanica*, *pharmaceutica*, and *cirurgia*, have survived. But the word *dynamidia* is conspicuously absent from modern, as well as from ancient, medical literature (1).

The remote origins of the term *dynamidia* lead us back to HIPPOCRATES and the Greek word *δύναμις* from which it is obviously derived. HIPPOCRATES wrote a treatise *περὶ λιθῶν δυνάμεως* but the medieval *dynamidia* are more directly traceable to his *περὶ διαίτης* (book II), in which he discussed at length the *δύναμις* of geographical locations, winds, foods, drinks, and various forms of exercise. None of his works, however, reveal any term that exactly corresponds to *dynamidia* (2). Likewise, in GALEN's genuine works, the term *δύναμις* is to be found (3);

(1) So far as modern medicine is concerned, pharmacology has a sub-field that is known as pharmaco-dynamics; and words such as *dyname*, *dynamometer*, and *dynamograph*, can be found in most medical dictionaries. But *dynamidia* seems to be absolutely unused by the medical science of our day. This, as well as the numerous other examples of medieval medical terms now unknown, emphasizes a need that has impressed many medievalists; viz. the desirability of a medical-scientific “Ducange.”

(2) The *dynamidia* listed among the Latin works attributed to HIPPOCRATES in PAULY-WISSOWA (VIII, 1849) is medieval, not classical. It will be considered below.

(3) PAULY-WISSOWA (VII, 585 ff.) lists the following among GALEN's medical works: *περὶ τροφῶν δυνάμεως* and *περὶ κράσεως καὶ δυνάμεως τῶν ἀπλῶν φαρμάκων*. Among his non-medical works, are the following titles: *φροσιμῶν δυνάμεων* (PAULY-WISSOWA, VII, 583), and several others in the *Scripta Minora* edited by J. MARQUARDT, J. MUELLER, and G. HELMREICH (Leipzig, TEUBNER; 1891), vols. II, III.

there is, however, no trace of the word *dynamidia*. The same is true of other Graeco-Roman or Byzantine writers (4). Apparently classical medicine did not use the term *dynamidia*; nevertheless, as we shall see, it did furnish the root from which the word was derived, and much of the material that comprised certain of the medieval *dynamidia*.

Sometime during the early medieval centuries, and not (as has often been inferred) during the age of the great Salernitan physicians, the term *dynamidia* came into use in the West (5). It is possible that late Roman writers used it to designate the medical effects of herbs. In the introductory letters accompanying MARCELLUS' *de medicamentis*, the Latin word *dynames* is mentioned in this restricted sense (6). Quite similar in its connotations is our first known use of the actual term *dynamidia*; in the *Etymologiae* of ISIDORE OF SEVILLE, who died in the year 636 A.D. In a chapter dealing with medicine, and a section devoted to medical books, he wrote as follows: "*Dynamidia (est) potentia herbarum, et vis et possibilitas. Nam in herbarum cura vis ipso dynamis dicitur. Unde dynamidia nuncupatur, ubi eorum medicinae scribuntur.*" (7) So far as I know, this is the only existing definition of the term. It has been suggested that ISIDORE coined the word *dynamidia* in order to avoid the use of the theological

(4) An Alexandrian physician of the first century B.C. wrote concerning the *δυναμειος* of medicaments. G. SCHELENZ, *Geschichte der Pharmacie* (Berlin, 1904), p. 131. In the thirteenth century, at Constantinople, NIKOLAOS MYREPSOS gave the title *δυναμειόν* to his collection of pharmaceutical recipes. M. NEUBURGER, *Geschichte der Medizin* (Stuttgart, 1921), II, part I, p. 133.

(5) G. MEYER, in his *Geschichte der Botanik* (Königsburg, 1856), III, 488 ff., seems to have suggested the theory of the Salernitan origin of *dynamidia*. At any rate he has been used as an authority for statements such as the following: "il est bon de noter que les *Dynamidia* sortent de l'école de Salerne." A. THOMAS, *Nouveaux Essais de la Philologie Française* (Paris, 1905), p. 271. NEUBURGER (*Op. cit.*, II, part I, p. 256) treats of *dynamidia* much more briefly than Meyer, but more accurately; i.e., as a phase of early medieval medicine.

(6) Toward the end of the pseudo-Hippocratic letter *ad Maecenatem* the following passage is found: "Terenti Euelpisti in ultimo libello leges *dynames herbarum*, vim eius et potestatem nos observare debere..." The best edition is that of NIEDERMANN in *Corpus Medicorum Latinorum* (Leipzig, 1916), V, pp. 16-17. Nothing save what appears in this passage is known of "Terenti Euelpisti." See, however, PAULY-WISSOWA, "Terentius Euelpistus."

(7) Book. iv, chapter 10.

term *virtus* for inanimate objects (8). It seems more likely, in view of the similarity in wording, that he worked out his explanation on the basis of the MARCELLUS material, or some other such treatise. If ISIDORE actually coined the word, it was due to his philological leanings to expressions "quae Graeci vocant," rather than to any theological inhibition. One can well imagine the great Spanish scholar substituting for the simple word *virtus*, a Graeco-Latin term such as *dynamidia* which could be rolled under a classically trained tongue.

But, whatever ISIDORE's motives, and however accurate his etymology, his definition of *dynamidia* is not acceptable. It is doubtful whether the middle ages ever used the expression with the restriction that he applied; viz., to herbs (9). Either his definition was inaccurate, or the use of the term changed within the next three centuries. For instance, in the tenth century, RICHER OF RHEIMS, a medically trained chronicler of Northern France, referred to *dinamidia*, *farmaceutica*, *butanica*, et *cirurgia* as the fields of medical knowledge with which an expert physician should be acquainted (10). RICHER's *butanica* was undoubtedly the science of herbs, therefore his *farmaceutica* and *dynamidia* must have had a different, and broader application. It seems probable that his *dynamidia* comprised the knowledge of the effects either of drugs (i.e., pharmacology), or of foods, drinks, etc., (i.e., diet). Turning to the existing medical manuscripts of this period, we find definite evidence of the broader conceptions

(8) "ISIDOR konnte aber als Theologe *virtus* nicht auf Pflanzen anwenden; darum schreibt er: *dynamidia*..." O. PROBST, "ISIDORS Schrift 'de medicina'," *Archiv für Geschichte der Medizin* (1915), VIII, 36. On the contrary, the constant occurrence of *virtus* in medieval herbal literature would seem to indicate that there was no such objection on the part of medieval writers, most of whom were clerics.

(9) The only *dynamidia* I have discovered which indicates a tendency to restrict the term in any way, is a *liber dinamidii id est farmaceuticon* from an eleventh century Vendome ms., 109, folios 98-134. Even this is not restricted to herbs, but deals with antidotes of various kinds. It is in reality a *dynamidia* of medicines. The same ms. (folio 87) contains a fragment of a *dynam(idia) medicamentorum*.

(10) *Historia* IV, 50; see also II, 59, which contains another reference to the same four fields. I have given detailed treatment of RICHER's medical work in "Tenth Century Medicine as seen in the *Historia* of RICHER OF RHEIMS," *Bulletin of the Institute of the History of Medicine* (1934), II, 347 ff., in *Bulletin of the Johns Hopkins Hospital*, vol. IV.

of *dynamidia*. In a tenth century manuscript of Chartres (ms. 62, folios 101 r. and v., 107 r.) and likewise in a tenth-eleventh century manuscript of St. Gall (ms. 752, p. 271), are found medical handbooks containing references to *dinamidiis* for further information as to remedies. The nature of these *dynamidia-books* is made clear by one reference in particular. It is found in the Chartres handbook (ms. 62, folio 54 v.), in a section which seems to have been an important part of the dynamidic literature of the period (11). It appears at the end of a treatise concerning the efficacy of various medical materials and methods and reads as follows: "Even incurable diseases should nevertheless be improved by means of medicaments, and *dinamidis* comprises the description and the properties of all (medicaments) for the human body" (12). This inference to the effect that *dynamidia* concerned itself with "all medicaments," is corroborated by the title of this same treatise which reads as follows: "Truly this (*dynamidia*) is the description of the virtues of all medicaments pertaining to the science of medicine" (13). The conclusion seems unescapable that in tenth-eleventh century France, where RICHER lived and studied, and where these manuscript treatises were used, *dynamidia* was applied to a broader field than that indicated by ISIDORE's "power of herbs," and that there were books of *dynamidia*.

As we consider in detail the various examples of medieval books of *dynamidia*, we shall find further evidence of this fact. From the ninth century on, there are two distinctly different classes of medical material to which the name *dynamidia* was applied. One of these was derived from HIPPOCRATES; the other from GALEN, or at least from works attributed to him.

(11) This is the "Paternian letter," which will be discussed in detail later.

(12) "Cui (i.e., incurable diseases) tamen medicamentis subvenire oportet. Et haec demonstrationem et proprietatem omnium corporum hominum componunt *dinamidia*." Chartres ms. 62, folio 54 v.

(13) "Vera haec est virtutis demonstratio omnium medicamentorum qui ad artis medicinae pertinet." Chartres ms. 62, folio 54 r. A thirteenth-fourteenth century version of this treatise (Leipzig ms. 1118, folio 253 r.) entitled *Liber Galieni de dinamide* reads "Vera haec est *dinamis* et monstratio..." See K. SUDHOFF, "Zur Anatomie des Vindicianus," *Archiv für Geschichte der Medizin* (1915), VIII, 414-15.

HIPPOCRATIC DYNAMIDIA

The trail of the Hippocratic *dynamidia* leads back to that portion of book II of HIPPOCRATES' *περὶ διαίτης* that deals with the *δύναμις* of geographical locations, winds, foods, drinks, and exercise (14). This material on diet (or regimine, as it is sometimes called) seems to have been transmitted to the middle ages by way of Roman compilations. The Latinized text, often with strangely little variation from the Greek subject matter, appears in early medieval versions such as the following; (A) the *de medicina* attributed to PLINIUS SECUNDUS (15), (B) the *medicinae ex oleribus et pomis* attributed to GARGILIUS MARTIALIS (16), (C) the *diaeta THEODORI* (17), (D) the *de observatione ciborum* which appears in the form of a letter, *epistula Anthimi viri inlustris comitis et legatarii ad gloriosissimum Theudericum regem Francorum* (18), (E) the *de cibis vel potum* of HIPPOCRATES (19), and (F) a three-fold version which we classify as the genuine HIPPOCRATIC *dynamidia* (20),

Although all of the above-mentioned versions contain much of HIPPOCRATES' dietetic material, versions E and F bear such a striking resemblance to the Greek original that they deserve careful examination. They have comparatively little extraneous material, and taken together they comprise most of the subject matter of book II of the *περὶ διαίτης*. But, despite their common origin, they show sufficient variations to account for the fact

(14) I have found only one medieval *dynamidia* which treats of the virtues of exercise, and this is a strangely jumbled, eleventh-century French manuscript (B.N., 7028, folio 144 r.). Furthermore, the passage in question occurs in a section ascribed to GALEN; *de dinamidiis et variis constitutionibus medicinae quae Galienus ad Paternianum dirigit*.

(15) Edited by V. ROSE (Leipzig, TEUBNER; 1875).

(16) *Ibid.*

(17) Published by K. SUDHOFF, in *Archiv für Geschichte der Medizin*, (1915), VIII, 377 ff. SUDHOFF bases his text upon several manuscripts, the earliest of which is an eleventh-century Harleianus. He does not mention the eleventh-century *dieta Theodori* in Copenhagen G. L. Kgl. S. 1653, quarto, folios 66-72.

(18) Published in V. ROSE, *Anecdota Graeca et Graecolatina* (Berlin, 1870), II, 41 ff.

(19) *Ibid.*, II, 151 ff.

(20) The various examples of this version will be discussed in detail below.

that version F belongs to the dynamidia whereas version E does not (21). In the first place, they differ in subject matter (22). Of even greater significance is the difference in wording; notably the exaggerated use of *virtus* in version F. Strange to say, neither version translated the original Greek word *δύναμις* into its obvious Latin equivalent *dynamis* (23). Both used *virtus*, but version F contains a much higher proportion than does version E (24). This seems to have been due to the fact that version F contained (1) passages from HIPPOCRATES, in the original of which *δύναμις* occurred frequently (25), and (2) additional passages from treatises of unknown identity which were heavily laden with *virtus* (26).

(21) So far as I have been able to discover, version E never bore the title *dynamidia*. It is possible that it was the treatise referred to in the *Institutiones* of CASSIODORUS (i, 31) as *Hippocratis de herbis et curis* (cibis?). See ROSE, *Anecdota*, II, 118-19. It appears in medieval manuscripts, as follows: (1) book IV of a medical compendium (of five books) in a ninth century manuscript of St. Gall (ms. 762, pp. 187-216); book IV is entitled *Liber ippocrati medici de cibis vel de potum*; (2) a twelfth century British Museum manuscript (Sloan, 670. 4, folios 40 ff.) has a portion of the text under the title *Liber dietarum yppocratis de diversis cibis*.

(22) Version E, for instance, reproduces most of HIPPOCRATES' chapters on animal substances such as meats, and on miscellaneous factors such as wines, sleep, vomiting, etc., Version F, on the other hand, contains the Hippocratic material concerning vegetable substances such as grains and herbs, and concerning locations and winds; also some sections from GARGILIUS MARTIALIS.

(23) This is strange. ISIDORE (*Etymologiae*, iv, 10) used the word *dynamis*, and it appears (in the form *dinamis*) in a thirteenth-fourteenth century Galenic dynamidia (see *above*, note 13). So far as I know, no medieval version of HIPPOCRATES' dietetic used the Latinized form of the original Greek term.

(24) This is vividly illustrated by a comparison of the frequency of the word *virtus* in the three versions (D, E, and F) which appear in the same ninth century manuscript (St. Gall, 762). Version D has only one *virtus* in the entire 42 pages (218-60); Version E has 7 in 30 pages (187-216). Version F has 34 in 47 pages (25-72). It would seem that those versions of HIPPOCRATES' dietetic which contained a high proportion of *virtus* were classed as *dynamidia* and often given that title.

(25) For instance, sections 38 (only the last part) and 39 of HIPPOCRATES' *περι διαίτης*, book II, appear in version F (prolog and chapters 1-2) with little change save that of language. The five examples of *δύναμις* in HIPPOCRATES' original Greek text appear in the Latin text as *virtus*, save for the first which became *qualitas*. In addition, the Latin text has two extra *virtutes*, thrown in (as it were) for good measure.

(26) The chapters concerning vegetables and herbs contain material and *virtutes* that are not in HIPPOCRATES. They are similar, but by no means identical, to version B, the so-called *Gargilius Martialis* book; which has much less of *virtus*. See V. ROSE's parallel texts, in his edition of *Plinii Secundi quae fertur una cum Gargilii Martialis medicina* (Leipzig, Teubner; 1875) 131 ff.

Whatever the causal factors, it is clear that the F version of HIPPOCRATES strongly emphasizes the term *virtus* and the subject matter concerned with vegetable substances (i.e., herbs, vegetables, fruits, etc.). And such is the basis of the true Hippocratic *dynamidia*.

A detailed examination of the existing examples of the Hippocratic *dynamidia* reveals, at the outset, a disconcerting fact; this "F version" material does not always appear under the title *dynamidia*. Of the three outstanding texts which have come down to us, the earliest bears the strange title *de virtutibus herbarum*. This text, which has been published by ROSE (27) from a ninth century manuscript (762) of St. Gall constitutes book I of a five-book compendium (28). The title, *de virtutibus herbarum* is misleading, for the treatise deals with the *virtutes* of geographical locations, winds, fruits, grains, and vegetables, as well as of herbs. A more accurate title would be *de virtutibus* (or *dynamis*) *ciborum vegetariorum*. A more fitting title, from the standpoint of the modern classifier, would be *dynamidia Hippocratis*. But looseness of nomenclature was characteristic of medieval times. And it is easy to understand the presence of both *virtutibus* and *herbarum* in this title when one recollects the emphasis given to both in the text. If *herbarum* be taken in the broadest possible sense, to include all plants, it is a perfectly logical title. Finally, however, regardless of title, the *de virtutibus herbarum* text contains the distinctively HIPPOCRATES dietetic which is entitled *dynamidia* in two other important texts.

Our second text, one that is almost identical to the *de virtutibus herbarum* in subject matter, is entitled *liber dynamidiorum*. It has been published by MAI (29), from a tenth century Vatican manuscript. This also is a five-book compendium, which when compared with the St. Gall compendium, shows both likenesses

(27) *Anecdota*, II, 131 ff.

(28) Book II *de erbas galieni et apollei et circonis* (i.e., CHIRONIS) is a GALEN-APULEIUS compilation; book III *liber virtutes pigmentorum vel herbarum aromaticas* is based on the Galenic alphabet of *simplicium medicinalium*; book IV *liber ippocratici medici de cibis vel de potum* is the Hippocratic dietetic described above as version E; book V *Epistola Antemi...* is the *de observatione ciborum* described above as version D. See ROSE, *Anecdota*, II, 121 ff. for descriptions of these five books.

(29) A. MAI, *Classicorum Auctorum* (Rome, 1835), VII, 399 ff.

and differences. (30) But, the essential factor is that it contains the Hippocratic material on locations, winds, fruits, grains, vegetables, and herbs; furthermore, it bears the title *dynamidia* (31). Our third text is entitled *dinamidia Ypocratis*. It has been published by J. SCHOTTUS (32) in a five-book compendium that is similar, but not identical, to either the St. Gall or the Vatican compendia (33). The *dinamidia* comprises book II of the compendium. This same treatise, under the title *dinamedia* [sic] *Ypocratis*, is found in a twelfth century British Museum manuscript (Sloar, 670. 4, folios 34 ff.), following immediately after a *de herbarum* of ORIBASIIUS. Text number 3 is similar, though not identical, in subject matter, to the other two texts (34).

The conclusion seems obvious that the term *dynamidia* was used often, though not always, as the title for material concerning the *virtutes* of locations, winds, and vegetarian foods. It seems

(30) Book I *liber dynamidiorum*, though badly mixed, is the same as book I of St. Gall, *de virtutibus herbarum*; book II, also entitled *liber dynamidiorum* contains, for the most part, the GALEN-APULEIUS material of St. Gall book II; this book is certainly not a *Hippocratic dynamidia* and probably not a genuine *Galenic dynamidia*; book III is based on GARGILIUS MARTIALIS and PSEUDO-PLINY; books IV-V are based on PSEUDO-PLINY, APULEIUS, and MARCELLUS. See ROSE, *Anecdota*, II, 110 ff., for brief comments on MAI's text.

(31) In English libraries there were the following manuscripts which, from the similarity of titles, may be classed as possible members of the MAI school of Hippocratic *dynamidia*: (1) a *liber dinamidiorum et aliorum mustorum in uno vol.* was listed in the twelfth-century catalogue of Peterboro monastery according to G. BECKER, *Catalogi bibliothecarum antiqui* (Bonn, 1885), p. 238; (2) a *liber dynamidiorum* was listed in the same codex with a *liber dietarum univrsarum Ysaak*, in a fourteenth century catalogue of the Durham Cathedral library (*Catalogues of the Library of Durham Cathedral*, London, 1837; Surtees Society), pp. 33, 110. There are several examples of *Galenic dynamidia* in English libraries and library catalogues, and the examples cited may have belonged to this class (to be considered below).

(32) *Oribasii de simplicibus libri V* (Argent. 1553).

(33) Book I *de virtutibus herbarum* is from APULEIUS and, despite the title, is not the same as book I of the St. Gall text; Book II is the *dynamidia*, and for the most part resembles books I of the St. Gall and Vatican texts; book III *de herbis* is similar to book II of St. Gall; book IV *de virtutibus simplicium* is from an alphabetical collection in ORIBASIIUS; book V, also alphabetical, is from DIOSCORIDES and pseudo-Galenic works, and resembles book III of St. Gall. See ROSE, *Anecdota*, II, 110 ff., for remarks concerning this compendium, and comparisons with the Vatican and St. Gall compendia. See also MEYER, *op. cit.*, II, 270 ff., 319 ff.

(34) See ROSE, *Anecdota*, II, 110 ff. for remarks on the three texts.

never to have been used of the other Hippocratic material concerning meat foods, sleep, etc., Furthermore, the term *dynamidia* was not restricted to herbs, as ISIDORE OF SEVILLE's definition would indicate. On the other hand, it is clear that herbs (i.e., plants) occupied a predominant place in the Hippocratic *dynamidia*.

GALENIC DYNAMIDIA

The Galenic, in contrast to the Hippocratic, *dynamidia* were distinctly pharmaceutical. They were based on *materia medica* whereas the Hippocratic *dynamidia* consisted of dietetic material. The Galenic *dynamidia* were of two types which often appeared together; viz., (1) general introductory treatises that took the form of letters, and (2) lists (usually alphabetical) of herbs and other "Simples" (i.e., uncompounded medical substances). None of these works were strictly Galenic in origin, for they contained much material from sources such as DIOSCORIDES, APULEIUS and ORIBASIIUS (35). They were, however, usually attributed to GALEN.

Of the first type, the pseudo-Galenic letter *ad Paternianum* is the outstanding example. It is a short treatise of broad medical scope, that seems most often to have been used as a general introduction to more technically detailed materials. It has been published, but only in the old and often inaccessible "Juntine" editions of GALEN (36), as a *liber de dynamidiis*. It appears in early medieval manuscripts, with practically the same subject matter, but under the following slightly variant titles. (A) A tenth century ms. of Chartres (62, folios 54 r. and v.) has *virtus eorum quibus causis proficiunt Galieni dogma*; (B) An eleventh century ms. of Copenhagen (G. L. Kgl. S. 1653 qu., folio 60 r. and v.) has, at the end of a *liber Galieni* (containing an alphabetical *materia medica*) a portion of the opening lines, used as a title; viz., *Virtutis demonstratio omnium medicamentorum...*; (C) An eleventh century Paris ms. (B.N., 7028, folios 136 v. to 137 v.) has *Galeni liber de dinamidiis et variis virtutibus medicinae quae Galienus ad Paternianum dirigit*; (D) Another portion of the same

(35) See ROSE, *Anecdota*, II, 113 ff., and MEYER, *op. cit.*, III, 486 ff.

(36) *Opera Galeni* (Venice; 1556, 1586, 1609); in the section of *spuria*.

ms. (B.N. 7028, folios 144 r. to 146 r.) has *de dinamidiis et variis constitutionibus medicinae quae Galienus ad Paternianum* dirigit (37); (E) An eleventh century Montpellier ms. (185, folios 115-116) has the treatise in fragmentary form, without any title; and (F) a thirteenth-fourteenth century ms. of Leipzig (Universitätsbibliothek, ms. 1118, folios 253 r. to 254 r.) has *liber Galieni de dinamide*.

The significance of these titles, and the relationship of the terms *dinamidiis* and *virtutibus*, is shown by the opening lines of the treatise; viz., "*Vera haec est virtutis demonstratio (38) omnium medicamentorum qui ad artis medicinae scientiam pertinet.*" This passage, as has already been suggested, might be interpreted as a definition of *dynamidia*; viz., as "the explanation of the virtues of all medicaments." Galenic *dynamidia*, in both titles and subject matter, conform to this definition; they deal with the virtues of *all* medicaments.

The contents of the letter illustrate this fact. It deals, in a broad and general way, with the virtues of all classes of *materia medica*. After a brief introduction, in which the author refers to a book *ad Glauconem* and to an earlier one *ad Paternianum* concerning *pigmentis*, he states his purpose; viz., "to expound now the *dynamidia* of those (substances) which comprise many

(37) The similarity of titles of these two Paris texts (C and D) is interesting. The only real difference is that C has *virtutibus*, whereas D has *constitutionibus*. But the C text (folios 136 v. and 137) is in a different hand, and with a different number of lines per page, from the D text. There are also variations in the body of the two texts, and they are followed by different types of material. F. MARX, in his introduction to CELSUS' *Medicinae (Corpus Medicorum Latinorum, I, pp. xxxii ff.)*, insists that the portion of this ms. beginning with folio 136 (i.e., text C) was originally a separate ms., which was later bound with the CELSUS codex (folios 1-135). The difference in scribal hands, and the worn, stained condition of folio 136 r., supports his contention. If that is true, text C was the beginning of a medical manuscript. This theory leads to a corollary theory: was not text C, which appears in a different hand from the rest of the ms., and with different page lines, also originally separated from folios 144 ff.? The folds in the sheets of the ms. (folios 136 to 143 making one quaternion) support this theory. If this be true, text C and text D were originally separate. This assumption seems reasonable from the fact that text C is followed by a treatise concerning *pigmentis, metallis, herbis, and virtutibus lapidi*, whereas text D is followed by Hippocratic material concerning *cibis, potibus, exercise, and baths*.

(38) One text (F) has *dinamis et monstratio*, instead of *virtutis demonstratio*. Note also the use of *constitutionibus* along with *dinamidiis* in text D.

classes of names and differing natures; even as is shown below (39).” This is followed by brief descriptions of the various classes of medicaments, and their virtues; e.g., *hypnotica* or sleep-producers, *peptica* and *eustomacha* for digestion, *stiptica* and *relaxatoria* for retarding or hastening elimination, and so on; 22 classes in all. Then come 10 classes “from which medicaments are composed”; viz., from *animalibus marinis*, *animalibus terrenis*, *herbis*, *seminibus*, *lignis*, *lapidibus*, *floribus*, *succo*, *lachryma*, and *metallicis rebus*; next, the four means (*visus*, *tactus*, *odor*, and *sapor*) by which the *qualitas et potentia* of substances are recognized; and finally the use of contraries and combinations of substances. The treatise ends with the conclusion that even with the use of *medicamentum*, *ferrum et ignem*, some ailments are incurable, and can only be *mitigated* by means of medicaments; and the explanation of the virtues of these comprises *dynamidia* (40). It is evident that the Paternian letter concerns itself, from start to finish, with the virtues of medicaments. Furthermore, at the beginning and end of the treatise, the term *dynamidia* (or its equivalent, *virtus*) is prominent. Of its own right, then, this short treatise merited, and also obtained, the title *dynamidia*.

(39) *Nunc vero dynamidiam* (virtutes, in some texts) *ipsorum omnium quae multis generibus nominum et dissimilibus rationibus constat, sicut infra ostenditur.*

(40) See above, p. 3, for quotations from the closing lines of the letter as to the nature of *dynamidia*. Some of the unpublished manuscript texts (e.g., A, C, D, and F) have concluding sentences that are not in the printed edition. They follow immediately after the passage concerning incurable diseases; they contain the important description of *dynamidia*; and they read as follows: Cui (i.e., an incurable disease) tamen medicamentis subvenire oportet; et haec demonstrationem et proprietatem omnium corporum hominum componunt dynamidia. Quod si commentarium compositionis tecum (non) habueris, ex his libris duobus pigmentorum (coniecturam faciens) omnia (cum integritate) melius facies. The endings of the various texts differ; e.g., A has *melius integra facies*; C has *valetudini et uni*; etc., The significant factor in the final sentence is the reference to *commentarium compositionis* and *libris duobus pigmentorum*; these seem to be the medical works mentioned in the opening lines of the letter; viz., (commentarium) *confectionis ad Glauconem conscriptam*; in *secundo tibi carissime Paterniane omnium pigmentorum intellectum, et qualitatem, et effectum posui. Nunc vero* (tertia) *virtutes* (dynamidiam) *omnium nominum... exponere institui.* These two passages seem to recognize three classes of medical handbooks: (1) commentaries on the composition or confection of medicaments (dedicated to GLAUCO); (2) books on the virtues of *pigmentorum* (i.e., aromatics); and (3) books on the virtues of all classes of medicaments. The inference is that PATERNIAN, to whom (2) and (3) were dedicated, could if need be get along without (1).

The broad scope of the Paternian letter tended to encourage its use as an introduction to more detailed treatises concerning the virtues of medicaments. In several cases it appears in such close relationship to collections of "Simples," that the two works form a dynamidic unity (41). This is particularly true of texts A and B, each of which is accompanied by an alphabetical list of some 300 medicaments, with descriptions of the nature and *virtutes* of each (42). This so-called *alphabetum Galieni ad Paternianum* bears a close relationship to the Paternian letter. In the first place, the name *Paternianus* is associated with both. Secondly, both are dynamidic in character; that is, they are concerned with the virtues of all medicaments. The *letter* treats of them as general classes; the *alphabet* describes each of 300 separate medicaments in detail (43). But, even though the alphabet had certain dynamidic characteristics, it did not, of itself, bear that title. In at least one case, it appears under the title *de simplicibus medicaminibus*, with another Paternian introduction (44). As in the case of certain of the versions of

(41) Only in one manuscript that I have considered does the Paternian letter seem to be a self-sustaining unit. This is text F. In two others (C and E) it appears alone, but both are fragmentary portions of manuscripts.

(42) This Paternian alphabet is merely one of the numerous medieval collections of material from DIOSCORIDES, etc.; see ROSE, *Anecdota*, II, 113 ff.

(43) For instance, the letter classifies medicaments according to their appearance, odor, etc.; the alphabet gives the appearance, etc., of each medicament. Again, the letter classifies medicaments according to their uses or virtues; the alphabet gives the uses (often employing the term *vires*) of each. One of the shorter passages from the alphabet will suffice as an illustration. *De Hyacintho: Hyacinthus thyrsulum habet levem flos purpureum folia et radices quasi vulvi, tota herba viribus et affectu stiptica est.* It is also noteworthy that the alphabet treats of grains, stones, metals, etc.; i.e., of all of the classes of medicaments mentioned in the letter. This is true, despite the fact that the alphabet sometimes ends with the misleading *explicit qualitas omnium herbarium*; e.g., in text A.

(44) In the Juntine edition (Venice, 1609) of *Spuria Galeni* the alphabet is preceded by a Paternian letter that reads as follows. Cum mihi proposuissem, charissime Paterniane, omnia sinigmata tam metallica quam aromatica, et omnem herbationem describere, optimum duxi, quia studiosissimum et peritissimum esse te probavi. Itaque accipe tibe exemplum voluntatis et ingenii offero. Igitur frater sollicitè exquire tota tua peritia hanc scripturam; ne autem calumniarieris prospexi. Et nequis cum aut herbulam aut aliquam aliam speciem, sive aromaticam sive metallicam requirit, diutius erraret, et totum volumen evolueret ordine primarum literarum abcd etc., agam omnia sinigmata nominare; quae in simplario tractantur, et in usum medicinae cadunt. Incipiemus igitur ab a et sic deinceps ad extremam literam perveniemus. At the end of the alphabet is a short epilogue,

HIPPOCRATES' dietetic, it seems that the title *dynamidia* was applied only to works that had a high proportion of *virtutes* and some sort of relationship to the word *dynamis*.

We turn now to a class of Galenic *dynamidia* which indicates that the term was not restricted to Paternian works. In manuscripts of the later Middle Ages, particularly in England, *dynamidia* was applied to letters and alphabets which we may call Platearian, i.e., related to the twelfth century writer, MATTHAEUS PLATEARIUS THE YOUNGER. In a twelfth century English manuscript (Gonville and Gaius College, 379-599, folios 55 ff.), there is a *liber dinamidiarum* that contains (1) a pseudo-Hippocratic-Galenic letter *ad Maecenatem* (45), followed by (2) an alphabetical list of medicaments (from *aloes* to *zuccarum*) entitled *Platearius de medicinis* (46). A thirteenth century English manuscript (Trinity College, 912, folios 313-31) has still another dynamidic letter (47), but it is not accompanied by an alphabetical list. (48)

viz., Haec sunt frater charissime Paterniane, quae memoriae nostrae subvenire potuerunt; et quae partim ipsi probavimus, et quae experti sumus, et apud antiquos et receptissimos auctores medicinae invenimus. Nunc pro tua examinatissima diligentia curabis omnia examinare, et etiam singulas res cum scriptura comparare, ideo ut si quis post auctorum lectiones ad hanc fuerit conversius scripturam, in nullo possit, reprobis inveniri.

(45) The letter is known, from its opening lines, as *libellum quem rogasti*. It has been published as one of the *epistulae diversorum* prefacing MARCELLUS, *de medicamentis* (*Corpus Medicorum Latinorum*, V, pp. 13 ff.); and also in the *Spuria Galeni*, where it comprises the opening sections of the *Galenii attributus liber de dynamidiis* (a compilation of medicaments and ailments, quite diverse and miscellaneous in character).

(46) This same Platearian alphabet is also found, without an introductory letter, in the following manuscripts: (1) a fifteenth century Trinity College ms., 1422, folios 137-41, under the title *Platearius abbreviatus. aloen... zuccarum. explicit Platearius sub compendio alphabeti*; and (2) a fifteenth century Jesus College ms., 43, folios 110-21, without title and in fragmentary form. The alphabet is also to be found, prefaced by the well-known letter, *circa instans*, in the following thirteenth-fourteenth century manuscripts: (1) Trinity College, ms. 1398, folios 1-5; (2) Trinity College, ms. 912, folios 51-118; (3) Trinity College, ms. 919, folios 1-41; and (4) Worcester ms. 52, folios 3-55.

(47) The letter ends as follows: ... *dinamidia vis herbarum*. Its opening lines (*cogitanti mihi de simplicium medicinarum virtutibus*) have given it the well-known title *cogitanti mihi*. It is attributed to JOHN OF SAINT PAUL, but is thought to have been originally a part of the *liber virtutum* or *liber gradum* of CONSTANTINE OF SALERNO.

(48) In a fourteenth century English manuscript (Trinity College, ms. 1398) the *cogitanti mihi* letter appears with a fragmentary alphabet (*de arthemisia... de*

The conclusion seems justified that the title *dynamidia* was applied, first and foremost, to the pseudo-Galenic letter to Paternian which treated in a general way of the virtues of all medicaments. But, by reason of the fact that this letter was used as an introduction to alphabetical lists of medicaments, the title came to include the alphabets as well. Until the thirteenth century, it was doubtless restricted to the Paternian letter and alphabet. But later it was applied also to similar works, such as the Platearian letters and alphabets. In short, *dynamidia* tended to include works that were associated with, or similar to, the original dynamidic treatise.

During the late Middle Ages, Galenic *dynamidia* seem to have completely eclipsed Hippocratic *dynamidia*. I know of none that bear HIPPOCRATES' name. A few titles will suffice to indicate the trend toward GALEN: (1) a *dinamidiorum Galieni* appears in a thirteenth century Paris ms. (B. N., 15113); (2) an *eiusdem* (i.e., GALIENI) *liber magnus dynamidiorum* is mentioned by RICHARD OF FOURNIVAL (about 1250), according to DELISLE's *Cabinet des manuscrits* (II, 533); (3) ROGER BACON mentioned GALEN's *dinamidiarum*, in his *de erroribus medicorum* (49); (4) a *liber dinamidiorum* is listed in the same codex with a *liber qui dicitur Platearius*, in the fourteenth century *Catalogue of Durham Cathedral Library* (*op. cit.*, pp. 7, 33, 39); (5) an *experimenta dinamidiorum libri Galieni* appears in a fifteenth century manuscript of the British Museum (34.111); and (6) there are several *dynamidia* that may have been Galenic, in the English manuscripts listed above (note 31) as questionably Hippocratic.

In summary, the following tentative conclusions may be made concerning Hippocratic and Galenic *dynamidia*. (1) The term was used with far more flexibility than the definition of ISIDORE OF SEVILLE indicates. During late Roman times, *dynamidia* may have referred only to herbs, but during most of the medieval centuries it had a much broader significance. (2) During the

macis) which shows traces of the influence of MACER FLORIDUS and OTTO CREMONENSIS. The same letter appears, without alphabetical lists, in several thirteenth and fourteenth century manuscripts from France. Space is not available here for enumerating them.

(49) See Miss WELBORN's translation, with critical notes, in *Isis* (1932), XVIII, 26 ff.

tenth and eleventh centuries, *dynamidia* was applied, after the Hippocratic fashion, to such non-medical influences as geographical environment (i.e., locations and winds), vegetarian foods, and drinks. (3) Throughout the majority of the post-Carolingian centuries, however, *dynamidia* was applied to pseudo-Galenic treatises concerning the virtues of all classes of medicaments, along with their accompanying alphabetical lists (50). (4) Logically the term *dynamidia* should have included all works that dealt with the effects of *materia medica*. This would have included DIOSCORIDES, APULEIUS, MACER FLORIDUS, etc. But due perhaps to the fact that many of these works emphasized the descriptive botanical aspects of the subject, they were not considered as *dynamidia*. (5) Finally, the word *dynamidia* seems to have had much less vogue than its Latin equivalent *virtus*. This can be explained from two standpoints. First, the theological interests of the Middle Ages worked in favor of a word that had the connotations of *virtus*. Secondly, a Greek term could hope for only limited use in the Latin West. Only those who were better educated and more technical in their interests would use *dynamidia* in place of *virtus*.

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(50) *Dynamidia* merely touches the margin of the subject of medical alphabetical compendia. In addition to the dynamidic alphabets, there were the alphabetically arranged books of ORIBASIIUS, etc.; also the *hermenumata*, *antebalumina*, *synonima*, *glossaria medicalia*, etc.. Mr. J. M. GRIMES, working under my direction, has compiled some interesting and valuable information on alphabetical compendia in French and English manuscripts; this material is as yet unpublished. *Concordia*, or *concordanciae*, is another type of alphabetical compendia, on which I intend to publish some of my accumulated material in the near future. All in all, the "ready-reference" type of alphabetical handbook seems to have been an important part of medieval medical literature.

Historical papers in the journal "Human Biology" ⁽¹⁾

It has long been one of the writer's major tenets of faith that a real and definite interest in the history of science in general and particularly in that of his own special field should be part of the equipment of every scientific worker, and that this interest should at least occasionally translate itself into action by the doing of some actual research in the field. If the history of science should ever be left *wholly* to professional historians of science (which it presumably never will be) something rather important would be lost from the picture. The specialist in any branch of science inevitably has something in the way of attitude towards the historical development of his speciality, and critical insight into its meaning, that one who is not a specialist in that particular branch can probably never acquire. Consequently I have been accustomed to urge the students, assistants and colleagues in my laboratory to do some real work, however modest, upon the historical aspects of their subject.

When in 1929 the journal *Human Biology* was launched it was stated in the editorial Foreword that there would be a special department of the journal to be headed *Quotations*, "the basic purpose of which will be to enliven the journal, and also to aid in the cultivation of historical mindedness." *Human Biology* has now completed five and a half volumes and this purpose has been steadily adhered to. The segregation of such articles into a special department, and the heading "Quotations" have both been dropped because unnecessary in the one case, and misleading in the other. Our actual practice is to publish articles bearing upon the history of human biology in the widest sense, whether

(1) From the Department of Biology of the School of Hygiene and Public Health of the Johns Hopkins University.

they contain extensive quotations from rare works or do not. They may vary in length, and in fact have so varied, from the briefest note to a paper of 40 pages or more.

The following list gives the complete bibliographic citation of all the items of specifically historical purpose and interest that have so far appeared in *Human Biology*. The titles are arranged in alphabetic order of authors' names.

Items of Historical Interest in Human Biology, Vol. 1, No. 1, to Vol. 6, No. 2, inclusive

1. Anonymous. Organization for research in population. Vol. 6, pp. 223-239, 1934.
2. COX, E. A. Political parsons. Vol. 1, pp. 284-285, 1929. [Note on 1796 constitution of Tennessee.]
3. DALTON, MARY. Mortality in New York City a century and a quarter ago. Vol. 6, pp. 87-97, 1934.
4. DUBLIN, L. I., and A. J. LOTKA. The history of longevity in the United States. Vol. 6, pp. 43-86, 1934.
5. GAFAFER, W. M. The inhabitants of the island of St. Kilda and acute upper respiratory disease. Vol. 3, pp. 437-441, 1931. [Discussion of, and quotation from KENNETH MACAULAY's *History of St. Kilda*, 1764.]
6. — JOSEPH GLANVILL, a forgotten seventeenth century iconoclast. Vol. 4, pp. 121-130, 1932.
- 7.— KENELM DIGBY, seventeenth century psychotherapist. Vol. 5, pp. 506-515, 1933.
8. GOWEN, J. W. Anomalous sex-linked inheritance of color-blindness in relation to attached sex-chromosomes. Vol. 5, pp. 130-134, 1933. [A modern genetic interpretation of CUNIER's 1838 pedigree.]
9. KANNER, L. The names of the falling sickness. An introduction to the study of the folklore and cultural history of epilepsy. Vol. 2, pp. 109-127, 1930. [Bibliography of 55 titles].
10. MILLAR, W. M. Human abortion. Vol. 6, pp. 271-307, 1934. [Bibliography of over 90 titles. While this paper is in part an analytical discussion of current statistics of abortion, it is introduced by an interesting and useful historical discussion of ideas on the subject.]

11. MINER, J. R. Restrictions to marriage in eighteenth century Bavaria. Vol. 4, pp. 286-288, 1932.
12. — PIERRE-FRANÇOIS VERHULST, the discoverer of the logistic curve. Vol. 5, pp. 673-689, 1933. [Translation of QUETELET's *éloge* of VERHULST, with additional material and discussion. Complete bibliography of VERHULST's writings. Portrait.]
13. P.[EARL] R. Mr. Cranium's lecture. Vol. 1, pp. 139-142, 1929. [Relating to THOMAS LOVE PEACOCK's *Headlong Hall*.]
14. — Constitutional somatology. Vol. 1, pp. 283-284, 1929. [Note on Sir THOMAS BROWNE's views on physiognomy.]
15. — Dr. JOHN CROSS on physiognomy and constitution. Vol. 1, pp. 426-430, 1929.
16. — JOHN HUNTER on appetites and aging. Vol. 1, pp. 565-571, 1929. [Portrait.]
17. — COBBES questions and answers, 1614. Vol. 2, pp. 137-144, 1930.
18. — The history of a gesture. Vol. 2, pp. 566-568, 1930.
19. — HARVEY's post-mortem examination of THOMAS PARR. Vol. 3, pp. 138-142, 1931.
20. PEARL, R. An eighteenth century French evolutionist. Vol. 2, pp. 559-566, 1930. [Discussion of JEAN-BAPTISTE-RENÉ ROBINET, with a translation of the first chapter of his *Vue philosophique*, 1768.]
21. — On the alleged lethal effects of sexual continence in the Holy Land. Vol. 3, pp. 577-585, 1931. [Discussion of a passage in the *Itinerarium Peregrinorum et Gesta Regis Ricardi*.]
22. — An explanatory note regarding a more detailed classification of recent literature useful in the study of human biology. Vol. 4, pp. 131-133, 1932.
23. — TOBIAS VENNER and his *Via Recta*. Vol. 4, pp. 558-583, 1932. [Portrait and facsimiles of title pages. Contains the first publication of an explanation and example in the form of a folding plate, of the "biogram," a method of graphically exhibiting the duration and the chronological position of the lives of individuals, together with important general historical events, all in the same diagram. By

the use of the biogram it can be seen at a glance what important persons were contemporaries, and over what parts of their lives. The method should be of value in relation to various sorts of historical work. That it is already recognized to be useful is indicated in two ways : overtly by expression of appreciation by WILLIAM LUCAS (*Nature*, Vol. 133, March 24, 1934, p. 464), and subtly by NICHOLAS (*Trans. Conn. Acad. Arts and Sci.*, 32 : 1-19, 1933) who publishes a biogram relating to GOETHE without the slightest acknowledgment that this form of diagram had been invented, explained and published previously.]

24. PIERRACCINI, A. On the priority of the biological hereditary law of "anticipation." Vol. 4, pp. 554-557, 1932.
25. SMALLWOOD, W. M. Eugenics circa 590 B.C. Vol. 1, pp. 142-143, 1929. [Quotation from THEOGNIS OF MEGARA]
26. WOLFE, A. B. The fecundity and fertility of early man. Vol. 5, pp. 35-60, 1933.

In addition to the material noted in the foregoing list, *Human Biology* has, from the beginning, devoted from 10 to 20 odd pages of 8-point type in each issue to a carefully classified list of "Recent literature useful in the study of human biology." Great pains are taken to make the citations bibliographically complete, precise, and accurate, and to indicate the extent of the further bibliographic resources to be found in each work cited. We have had many expressions of favorable opinion regarding these lists, and are disposed to think that possibly the student of the history of those sciences relating directly to man may find them useful, as the student of human biology has.

(*Baltimore, Md.*)

RAYMOND PEARL.

John Tolhopf Again

To JOHN TOLHOPF, whose name is spelled in a variety of other ways as will become apparent as we proceed, I have come across a number of other references since writing the note which appears in the December, 1934 issue of *Isis* (XXII, 229). TRITHEMIUS, who was his contemporary, is said to mention him both in his *Catalogus illustrium virorum* (1) and *De scriptoribus ecclesiasticis* (2), works of which the first editions appeared in 1495 and 1494 respectively. He certainly does so in the work on ecclesiastical writers where he speaks of "JOHN THOLOF" as still living, as born in Franconia, as a canon of Regensburg and provost of Forchheim, as learned in both sacred and profane literature, a doctor of canon law, astronomer, cosmographer and most celebrated poet, of subtle genius and eloquent expression, and a writer both in metre and prose. None of his works had come to TRITHEMIUS's hands, but others mentioned his elegant letters,

(1) Fol. 68b, according to H. KEUSSEN, *Die Matrikel der Universität Köln*, II (1919), 481. I do not at present have access to this work of TRITHEMIUS.

(2) Edition of Basel, 1494, fol. 139r-v: "IOHANNES THOLOFUS natione teutonicus ex Francia orientali quae Franconia dicitur oriundus, canonicus Ratisponensis et praepositus Forchemensis, vir in divinis scripturis studiosus et eruditus et in saecularibus litteris egregie doctus, pontifici iuris doctor insignis, astronomus cosmographus et poeta celeberrimus, ingenio subtilis et disertus eloquio, scripsit tam metro quam prosa quaedam praeclara opuscula quibus nomen suum posteris commendavit. Sed nihil eorum ad manus nostras memini pervenisse. Feruntur autem ab his qui hominem probe noverunt eius in diversis rebus :

Epistolae elegantes liber i
Et quaedam in Mathematica
Et quaedam alia

Vivit usque hodie in civitate Ratisponensi provinciae Noricorum et varia conscribit, maximus doctorum hominum fautor sub MAXIMILIANO rege Romanorum et ALEXANDRO papa sexto anno domini Millesimo CCCC.XCIII, Indictione xii.

ASCHBACH, *Geschichte der Wiener Universität*, II, 429-30, cites "Trith. Script. eccles. ed. Fabr. No. 959," apparently some later edition.

his mathematical and other treatises. His death in 1503 is alluded to in a letter of WILIBALD PIRKHEIMER of November 17, 1503 (3) to CONRAD CELTES whose friend TOLHOPF was. Letters of CELTES to him are preserved from the years 1492, 1493 and 1494 (4), and CELTES refers to him in the third chapter of his *Norimberga* (5). He further addressed an ode to him. TOLHOPF in his letters to CELTES proposed to print the classical poets and commentaries on the *Sphere* and *Almagest* (6). His name appears in the matriculation book of the university of Cologne in 1499 as a doctor of decretals (7). GEORGE TANNSTETTER in his edition of PEURBACH's tables of eclipses at Vienna in 1514, in listing present or recent mathematicians in various cities and parts of Germany, names IOANNES TOLOPHUS for Regensburg (8). HEINRICH PANTALEON, writing in 1566 of illustrious men of Germany, chiefly repeated what TRITHEMIUS had said of "IOANNES THOLOPHUS" of Regensburg, except for the additional information that TOLHOPF had attended several universities (9).

The university records show him enrolled at Leipzig in 1465. In 1466 he was admitted to examination for the baccalaureate, in 1468 he is called master, in 1470 he was teaching, in 1474 rector. But in the meantime he went to Ingolstadt as professor in 1472, was rector there in 1473, and in 1475 was back there again as dean of the *via antiqua* or older realist medieval school of philosophy (10). ASCHBACH adds that he was a member of

(3) Quoted by BERNHARD HARTMANN, *Konrad Celtis in Nürnberg. Ein Beitrag zur Geschichte des Humanismus in Nürnberg*, Nürnberg, 1889, p. 66. (*Mittheil. des Vereins f. Gesch. d. Stadt Nürnberg*, Heft 8.)

(4) E. KLUEPFELIUS, *De vita et scriptis Comradi Celtis*, 1827, pp. 147-8, and p. 157 for the letter mentioned in the preceding note. KLÜPFEL spelled the name "JANUS TOLOPHUS."

(5) A. WERMINGHOFF, *Comrad Celtis*, 1921, p. 123.

(6) KLÜPFEL, *op. cit.*, pp. 107-8.

(7) KEUSSEN, *op. cit.*, II (1919), 481.

(8) GEORGE PEURBACH, *Tabulae eclipsisium* (edited by G. TANNSTETTER COLLI-MITIUS), Vienna, 1514, preliminary matter on unnumbered pages.

(9) HEINRICH PANTALEON, *Prosopographia heroum atque illustrium virorum totius Germaniae...*, Basel, 3 vols., 1565-1566, II, 468.

(10) For these dates see G. ERLER, *Die Matrikel der Universität Leipzig*, 3 vols., Leipzig, 1895-1902, I, 250, 292; I, 203, 214, 224; and KARL SUDHOFF, *Die medizinische Fakultät zu Leipzig im ersten Jahrhundert der Universität*, 1909, pp. 40-41 (*Studien z. Gesch. d. Medizin*, Heft 8.) The dates given by KEUSSEN, *op. cit.*, II, 481, do not agree with those given by ERLER and SUDHOFF. In the Leipzig records JOHN's last name is spelled TOLHOPH, DOLHOPFF and TOLHOPFF.

the Sodalitates of both the Rhine and the Danube, and that his travels led him to Vienna as well as Rome (11). In 1480 we find him installed at the court of MATTHIAS CORVINUS, king of Bohemia and Hungary, who asks in a letter of May 3 that his councillor and astrologer, HANUS TOLHOFF or DOLLHOFF or JANUS TOLOPHUS may continue to enjoy in absentia the income of his college fellowship at Leipzig (12). And in a manuscript at Wolfenbüttel of the *Stellarium* of JOHANNES TOLHOFF is a preface to king MATTHIAS opening, "Rem novam, serenissime princeps ac regum maxime..." (13).

New York City.

L. THORNDIKE.

(11) ASCHRACH, *op. cit.*, II, 429-30.

(12) STÜBEL, *Urkundenbuch der Universität Leipzig von 1409 zu 1555*, Leipzig, 1879, Nr. 182, p. 220, cited by SUDHOFF, *op. cit.*, p. 40, who further states on page 41 that in 1471 the name of TOLHOFF was among the collegiates of the great college.

(13) Of the MS., Wolfenbüttel 84.1. Aug., 32 fols., 272 × 195 mm., fol. 1 is reproduced in Plate XLVI by A. DE HEVESY, *La bibliothèque du roi Matthias Corvin*, Paris, 1923. This was a different work from the *De motibus celestium mobilium* described in my *Science and Thought in the Fifteenth Century*, 1929, Appendix 16, pp. 298-301.

Carnegie Institution of Washington.
Division of historical research.
Section of the history of science.

Seventeenth annual report for the period extending from July 1, 1934 to June 30, 1935 (Previous reports appeared in YEAR BOOKS of the Carnegie Institution, no. 18 to 33, 1919 to 1935; the 12th and following also appeared in ISIS, the latest in vol. 22, 435-439, 1935).

1. *Generalities.*—Dr. SARTON sailed from Southampton on September 21, 1934, reaching Lisbon on the 24th, in order to represent the United States government and the Carnegie Institution at the IIIrd International Congress of the History of Science. In the absence of the president, Dr. KARL SUDHOFF of Leipzig, Dr. SARTON was acting president of that congress and delivered the inaugural speech in Porto, on October 1. The main work of the congress was done at Coimbra and it was concluded at Lisbon on October 6. Dr. SARTON sailed from Lisbon on the 7th and reached Cambridge, Mass. on the 22. A brief report of the congress has already been published in *Isis* (vol. 22, 440-55), but it is worthwhile to emphasize once more the great importance of those meetings for the organization of our studies all over the world.

As scientific genius knows no frontiers, and is largely independent of nationality, race, or creed, the history of science is essentially an international subject. However there are linguistic and other technical difficulties which can be overcome only with the cooperation of foreign scholars. It is clear for example that it is easier for Scandinavians than for others to study the origins and development of science and learning in Scandinavia. Hence an international organization of our studies is not only important but in many cases indispensable. That organization is realized

partly by an International Academy, of which the main offices are in Paris (1), and partly by the International Congresses, which are triennial meetings of the Academy, open to all scholars interested in our studies.

The success of the Portuguese congress was due to the efforts of the Permanent Secretary and his staff, but even more so to the cooperation of our Portuguese colleagues whose hospitality was as generous and friendly as their country is beautiful,—and this is saying a great deal.

2. *Introduction to the History of Science*.—The work on this project, the major project of the section, continued steadily. Dr. M. C. WELBORN prepared many notes and bibliographies concerning fourteenth century scientists of the Latin West. Dr. SARTON devoted most of his time to the Jewish scientists of the same period. The third vol. of the *Introduction* will be devoted exclusively to the fourteenth century.

3. *Maya astronomy* (2).—A survey of the contributions to the study of Maya chronology—by FÖRSTEMANN, GOODMAN, THOMAS, BOWDITCH, MORLEY, MEINSHAUSEN, SPINDEN, WILLSON, GUTHE, TEEPLE, THOMPSON, MARTÍNEZ HERNÁNDEZ, LUDENDORFF, PALACIOS, ROYS, and BEYER—revealed the possibility of a new approach to the problem of correlating Maya and Christian dates.

In 1913, MEINSHAUSEN recognized that the pages 51 to 58 of the Dresden Codex contain a table of eclipse syzygies. WILLSON's attempt to derive a day-by-day correlation based on this table was unsuccessful; the posthumous publication, in 1924, of WILLSON's unfinished investigation conveyed, unfortunately, the impression that his negative results were final. Two erroneous assumptions underlying WILLSON's unfinished investigation ought to be mentioned here: first, that partial eclipses of the sun

(1) The founder and permanent secretary is ALDO MIELI. The Academy was founded in 1928. The offices are established at 12, rue Colbert, Paris II (close to the Bibliothèque Nationale). The new president is Dr. QUIDO VETTER, and the next congresses will take place the fourth, in Prague, 1937, the fifth, probably in Lausanne, 1940.

(2) This chapter was prepared by Dr. A. POGO who is now devoting most of his time to this project.

may be disregarded; and, second, that lunar eclipses do not have to be considered; moreover, he overlooked the existence of the tenth "picture", at the bottom of page 58 of the Dresden Codex. An example of a partial solar eclipse visible in the Maya territory is quoted in the bibliography accompanying this report; examples of lunar eclipses at Dresden "picture" intervals will be found in the table below.

In 1925, TEEPLE published his paper on the glyphs C, D, and E of the Supplementary Series of the inscriptions—a short and brilliant paper equalling in importance that of MEINSHAUSEN. TEEPLE's subsequent investigations of the lunar calendar of the Maya led him to consider the Dresden table of eclipse syzygies, but he did not attempt to exhaust the correlation possibilities it offers; incidentally, he overlooked, like WILLSON, the existence of the tenth "picture".

A study of the periodicity of groups of eclipses had to be made, in order to bring out the correlation possibilities offered by the pages 51 to 58 of the Dresden Codex, on the one hand, and by

Lunar saros series	Group at "picture" intervals	First exeligmos return	Second exeligmos return	"Picture" numbers	Intervals in days
L 76	— 43 Oct. 27.4	11 Nov. 29.5	65 Dec. 31.5	X	
L 93	— 41 Mar. 13.6	13 Apr. 14.5	67 May 17.5	I	502
L 152	— 37 Dec. 19.2	18 Jan. 20.3	72 Feb. 22.4	II	1742
L 187	— 34 Oct. 18.3	20 Nov. 19.3	74 Dec. 22.3	III	1034
L 5	— 30 Feb. 10.2	24 Mar. 14.2	78 Apr. 16.0	IV	1211
L 64	— 26 Nov. 18.4	28 Dec. 20.5	83 Jan. 22.6	V	1742
L 99	— 23 Sep. 16.1	31 Oct. 19.1	85 Nov. 20.2	VI	1033
L 140	— 19 Jan. 9.2	35 Feb. 11.2	89 Mar. 15.2	VII	1211
L 193	— 15 Apr. 23.5	39 May 26.4	93 June 27.4	VIII	1565
L 11	— 12 Aug. 16.1	42 Sep. 18.1	96 Oct. 20.2	IX	1211
L 35	— 10 July 26.3	44 Aug. 27.2	98 Sep. 29.2	X	709
					11960

the Supplementary Series, especially by glyph C, of the inscriptions, on the other. Cylindrical diagrams based on the Mec (Maya eclipse cycle of 11960 days = 405 lunations = 69 eclipse semesters = 23 double tzolkins) were constructed; they permit us to trace the development of the ideas which led to the introduction of

Supplementary Series and to the compilation of tables of eclipse syzygies. The preceding table may be used as an example of the periodicity of groups of lunar eclipses which were visible in the Maya territory and occurred at Dresden "picture" intervals.

The total solar eclipse of —43 October 11.9, preceding the first group of lunar eclipses of the table, was visible in the Maya territory, at sunset; the close conjunction with α Librae offered an opportunity of counting lunar cycles from a definite point in space as well as in time.

A preliminary survey of the correlations derived from groups of eclipses separated by Dresden "picture" intervals shows that a considerable amount of work will be needed in order to eliminate the spurious solutions; the final day-by-day correlation based on the Dresden table of eclipse syzygies and on the lunar cycles recorded in the Supplementary Series of the inscriptions must be compatible with a simple interpretation of the Venus table of the Dresden Codex and of the Venus dates of the inscriptions.

4. *Other investigations.*—Dr. WELBORN collected materials for an article on the Italian physician CHRISTOPHORUS DE HONESTIS (d. 1392) and for another on medical deontology in the fourteenth century.

Dr. SARTON continued the Arabic studies which are fundamental for all investigations concerning mediaeval science, and he investigated the genesis of our ideas on cathodic rays.

5. *Editing of Isis.*—*Isis* is a complementary publication to the *Introduction*. The latter is a systematic survey of our knowledge of the science and learning of definite periods (thus far, from HOMER to the end of the thirteenth century); the former, a collection of materials concerning that history in all times and places as it was developed by men of all nations, races, and creeds, and it is also a repository for all corrections and additions relative to the published parts of the *Introduction*. Thus if it should ever be necessary to prepare a new edition of the *Introduction*, many of the necessary data would be immediately available in their proper sequence.

During the year 1934-35, five numbers of *Isis* were published (61 to 65), forming the whole of vol. XXII and part of vols. XXI

and XXIII, a total of 1323 pages, 27 plates, 35 figures, 72 facsimiles. These five numbers contain 31 memoirs, 38 shorter items, 80 reviews and 1919 bibliographic notes.

The first volume of *Osiris* is being prepared to appear in January 1936. *Osiris* will be a collection of longer memoirs, or of series of memoirs devoted to single topics. It will be supplementary to *Isis* and to the *Introduction* (see *Isis* 22, 437). Thanks to *Osiris*, it will be possible to print in *Isis* a larger number of shorter papers, and the variety and interest of *Isis* will thus be considerably increased. However, these beneficial effects will not be felt at once, but only after the lapse of another year or two.

6. *Center of research in the history of science and learning.*—The offices of this section, kindly lent to Dr. SARTON by Harvard University, have gradually become thanks to the *Introduction* and to *Isis*, an international center of information for everything that concerns our studies. The collections of pamphlets, reprints, etc. kept in these offices are probably the most complete of their kind available anywhere, and they increase very fast. The new reprints grow to a two-foot pile in six weeks and are then distributed according to subjects in pamphlet boxes (more than four hundred double-sized boxes). Our collection of books is not as large, but we have immediate access to the books of the Harvard University Library (more than three million volumes).

This increase of our apparatus is very satisfactory, for it implies a gradual improvement in our work, but it is also somewhat disquieting, for it raises many difficulties. Problems of classification, registration, shelving, etc. which were hardly noticeable when the collections were small are becoming more and more obtrusive. Moreover the time is approaching when further increase will no longer be possible in the present rooms.

Inquiries which can be answered without too much trouble are generally answered within a few days. If more time and labor are involved than can be spared the inquiry is courteously acknowledged without answer. The number of interruptions in the form of visits, interviews, correspondence is constantly growing, and thus the time left for real work constantly reduced.

On the whole present conditions are favorable, but future ones very uncertain.

Lectures.—Dr. SARTON gave a course of 32 lectures on the history of science in the eighteenth and nineteenth centuries at Harvard University and the same course at Radcliffe College. He delivered lectures on Arabic science at Winthrop House in Cambridge, Mass., and at the joint meeting of the History of Science Society with the American Historical Association in Washington, D.C., on Dec. 29.

Staff.—GEORGE SARTON; ALEXANDER POGO; MARY CATHERINE WELBORN; FRANCES SIEGEL, secretary.

Dr. POGO is doing his work in the Library of Congress, study 33, Washington, D.C.; all others in the Harvard Library, study 185-9, in Cambridge, Mass.

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 - GEORGE CATLIN, "Indian-loving CATLIN" (1796-1872). *Isis* 22, 77-94, 2 pl., 2 fig., 1934.
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 - Who is AL-SĀHIR, author of a medical compilation? (Query 42). *Isis* 22, 224, 1934.

- Earliest monumental use of Arabic numerals, 1303 (Query 43). *Isis* 22, 224, 1934.
 - Mysterious alchemical symbols in paintings of the school of GENTILE DA FABRIANO, first half of fifteenth century (Query 45). *Isis* 22, 226-8, 1 pl., 2 fig. 1934.
 - Fortieth critical bibliography of the history and philosophy of science, and of the history of civilization (to Jan. 1934) with special reference to Antiquity in general, Egypt and Mesopotamia. *Isis* 22, 322-431, 1934.
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Notes and Correspondence

Query no. 54.—Cylindrical and diagonal calendars. The astronomical knowledge of the Battak (northern Sumatra, just north of the equator) seems to have escaped the attention of the historians of astronomy. A description of Fig. 1 will be found in "Der Kalender der Toba-Bataks auf Sumatra," by JOHS. WINKLER, in the *Zeitschrift für Ethnologie*, 45, 436-47, 1913. The calendar (porhalaan) is now used by medicine men for determining "lucky" and "unlucky" days; its nature and origin deserve, however, the attention of the historians of science. The Battak use the lunar year; the month has 30 days; the week has 7 days (see the diagonals beginning on the 7th, 14th, 21st, and 28th of the first month), but the subdivision of the month into three decads (ten-day periods) is clearly visible on the diagram. The cylindrical calendars are engraved on bamboo sticks (the 1st day near the lowest joint, the 30th day near the second joint), and may contain either 12 or 13 months. The relative position of the full moon and of Scorpio (hala) is an important feature of the porhalaan. The names of the first 7 days of the month differ but little from the Sanskrit names of the 7 planets

Fig. 1. The porhalaan of the Toba-Battak (Sumatra).
 From: J. WINKLER, *Der Kalender der Toba-Bataks auf Sumatra*.
Zeitschrift für Ethnologie, 45, 438, 1913.

arranged in the order derived from the "planetary hours"; the names of the 13th, 14th, and 15th day of the month are based on the Sanskrit designation, pūrṇāma (full moon); the names of the remaining days of the month reveal traces of an old-Batta subdivision of the lunar month into four quarters.

Are there other similar cylindrical or diagonal calendars in use in the Malay Archipelago? Is the porhalaan a remnant of the old-Batta civilization, or is it an importation from the mainland of Asia? What are the astronomical elements in the medical and magical writings of the Battak?

The subdivision of the month into three decads is the only analogy between the cylindrical calendars of the Battak and the diagonal calendars of the Asyutians; the vertical columns of the Asyut calendars correspond to decads, and the horizontal rows, to the 12 hours of the night.

A. POGO.

Query no. 55.—A plague treatise by Abner of Burgos? It is stated in the *Enciclopedia universal ilustrada* (vol. 1, 497, Barcelona, 1912) that the apostate ABNER of Burgos (alias ALFONSO DE VALLADOLID) who died about the middle of the fourteenth century, composed a treatise on the plague (una obra sobre la peste). That statement is repeated by FRANCISCO VERA: *La cultura española medieval* (vol. 1, 118, Madrid, 1933). On the other hand such a treatise is not included in the list given by MEYER KAYSERLING: *Biblioteca española-portuguesa-judaica* (Strasbourg, 1890, 114).

If ABNER composed a plague treatise, he may have written it in Hebrew, Latin or Spanish. Is such a Ms. available anywhere? The discovery of a Ms. would at the same time elucidate the facts concerning ABNER's medical career. Was he a physician? where did he obtain his M.D.? did he practice and teach medicine in Valladolid?

GEORGE SARTON.

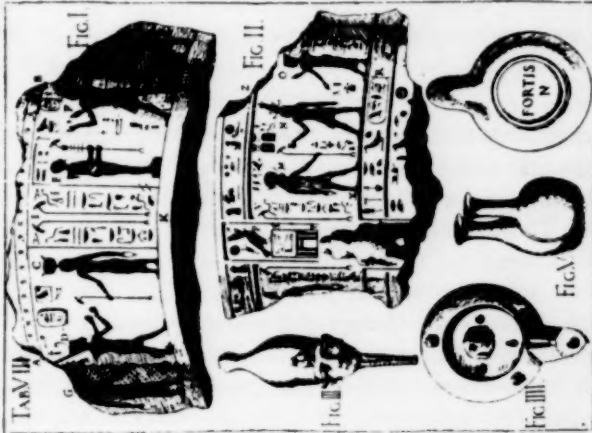
Query no. 56.—Nardi or Kircher?—Fig. 1 reproduces the pages 384 and 385 of ATHANASIVS KIRCHER's *Oedipus Aegyptiacus*, vol. 3, Rome 1654 (colophon: 1655), from the Harvard Library copy. The plate reproduced on p. 385 is, apparently, borrowed "ex Museo Gaddiano Florentino," by NARDI.

Did JACOPO NARDI (1476—ca. 1563) write a description of the collections of the Museo Gaddiano? If not, who was the NARDI mentioned by KIRCHER? Where and when was NARDI's work published? Did NARDI

interpret the two fragments of "Nilotic vases" as fragments of water clocks, or does KIRCHER deserve full credit for this interpretation? Was "Tabula VIII" on p. 385 printed from the original XVIIth-century plate? If so, it could be considered as one of the earliest examples of the reproduction, in print, of hieroglyphic inscriptions.

SYNT. XII. FRAGMENTA OBELISCORVM. 385 CAP. III.

Fragmenta vase ex lapide pyritico, & pari modo mergo vasis
terri videtur fuisse, quemadmodum ex rotunditate colligitur, in cuius

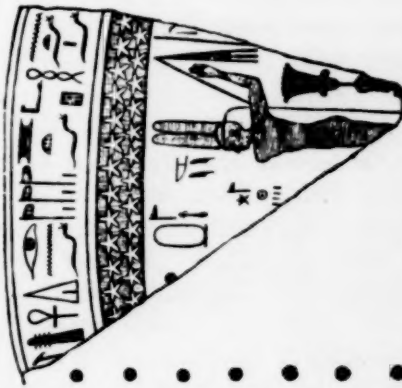


extrema superficie operis libri A. B. Melle, vs. Epoca prima docet, in
circuito, ponitur ac in precedenti. 381. quemadmodum ex portio-
ne circuleris patet inscriptum in his Gubernis, quot dicitur anno,
Cec. 1.

CAP. III. 384. OEDIPI ÆGYPTI. THEAT. HIEROGL.

plura regionem pertinetis. aiani, & ingenio antiquitatum Ægyptica-
rum corpus, quod dum hac scribo, ex videribus loci effulsit est, quom-
que non exiguum partem in meo Museo spectandam exhibere, luculenter
demonstrat.

Hæc eodem loco erutum fuit vase Nilotica fragmentum hierogly-
phicis notis referunt, ex quo speret Niloticorum rationum ratio & hor-
ma dignoscitur. Videtur illic linea in duodecim partes distributa, in
qua per interitorem vase superficem, sique in fundum, duodecim ordi-
ne æqualiter inter se distantes veluti termini quidam eminenter dispo-
nuntur, qui termini hæc dubie vel ad incrementum decrementumque
fluminis, vel ad horæ in hydrologio commemorandas, deputantur. In
exteriori vero vase superficie, ad extremum vase limbum, circulus est in
365 stellis distinctus, quos in anno dies sunt, fingunturque
præfatum index. Sequuntur deinde varia Apoptozæ Numina, quæ
cum aliis exposturimus, hæc in recentibus longæ esse nolias, sed loco
longioris discursum ipsam figuram apponam, ut sequitur.



Fragmentum
ex obelisco
in Museo
Kircheriano

Intra hæc fragmenta magis considerandis sunt quæque, quæ in
tabula VIII. præposita Nardius, ex Museo Gaddiano Florentino de-
ponit.

FIG. 1.—A. KIRCHER, *Oedipus Aegyptiacus*, v. 3, pp. 384-85, Rome, 1654 (reduced).
By courtesy of the Harvard College Library.

The fragment from the Museo Kircheriano is now in Turin; the two Museo Gaddiano fragments were acquired, in 1888, by the Hermitage, from the Bludov collection.
A. POGO.

Query No. 57.—Early decimal instruments.—HENRY LYTE's *Art of tens* (London, 1619), see *Isis* 23, 189, fig. 39, contains an advertisement for yards and two-foot rulers graduated decimally, sold by "Mr. THOMSON, dwelling in Hosier Lane, who make Geometricall Instruments."

Who was that instrument maker THOMSON? Have any of his instruments, and especially of the ones decimally graduated, survived? Are there any other decimal instruments anterior to the creation of the metric system? If such instruments are known I would be glad to publish descriptions of them in *Isis*.
 GEORGE SARTON.

Courses at the Massachusetts Institute of Technology, Cambridge, Mass. (U.S.A.).—The teaching of the History of Science, History of Engineering, and Scientific Method has here recently taken a new impetus. There is an introductory course in the *History of Science*, thirty lectures a term for two terms. This is a survey from earliest times to 1900. About fifteen men, juniors and seniors, elect this course every year. A course in the *History of Engineering* has also been revised and enlarged, thirty lectures during the first term. This course is semi-required for students of chemical engineering, elective for others. About fifty men take it annually. These two courses are in charge of R. S. WOODBURY.

Professor T. L. DAVIS offers a course of thirty lectures during the second term on the *History of Chemistry*. This is required of seniors in Chemistry, about twenty-five each year.

Professor W. P. ALLIS offers two connected half courses in the *Historical Development of Physics*, forty-five lectures each term. These are required of seniors in Physics, about twenty men each year.

At irregular intervals the Department of Biology offers a course in the *History of Biology*, fifteen lectures in one term.

Sophomores in the Department of Building Construction are required to take a course in *Building Forms and Details* which is an historical study of architectural engineering. Professor W. C. VOSS here gives thirty lectures for one term to about twenty men. Professor C. B. BREED of the Department of Civil Engineering offers thirty lectures, one term, in a course on the *Development of Transportation* from an engineering point of view. At irregular intervals the Department of Aeronautical Engineering offers a course in the *History of Aircraft*.

The course in *Scientific Writing and Thought* offered by R. S. WOODBURY is an introduction to the literature of science and to scientific method. Though somewhat philosophical in viewpoint, it includes rather wide reading in the classics of science and makes frequent use of illustrative

material from the history of science. It includes forty-five lectures, second term, to about 150 men.

There is a collection of about 700 lantern slides for use in these courses. These are of great assistance, especially in the courses in the history of engineering.

There is as yet no graduate work in these fields, but one graduate student in the introductory course in the *History of Science* has extended a paper on the "History of Warship Construction" to a book which will be published some time next year. The Department of Naval Architecture has the valuable Clark Collection of early books on ships and their construction, as well as a very complete Marine Museum which is particularly useful for studies of this sort. The large Vail Collection of books on electricity is as yet a virgin and rich mine of material on the history of electricity and electrical engineering.

ROBERT S. WOODBURY.

Corso di conversazione latina scientifica alla R. Università di Modena. Siamo informati che anche per l'anno accademico 1934-35 alla Regia Università di Modena è stato approvato il programma del corso libero di conversazione latina scientifica. È questo il settimo anno che il Prof. GIUSEPPE FAVARO, Direttore dell' Istituto anatomico della R. Università di Modena, svolge tale corso con pieno gradimento della Facoltà e della scolaresca; anzi la Facoltà di Medicina e Chirurgia, in vista di così efficace contributo per elevare la cultura dei giovani e far propugnare l'uso del latino a scopo di diffusione del pensiero scientifico ha votato uno speciale plauso all' illustre e benemerito Professore FAVARO." (*Rivista di storia delle scienze mediche et naturali* 25, 274, 1934).

Science in the XXth Century.—The Royal Jubilee which has been celebrated in England in May 1935 with such a delightful mixture of pomp and simplicity, magnificence and enthusiasm, has been an opportunity of reviewing all the events and activities of the last quarter of a century, including the scientific activities. These reviews will constitute excellent materials for the future historians of science who will have the appalling task of judging our times.

A special number of *Nature* (no. 3418, vol. 135, 669-755, May 4, 1935) is devoted to such retrospective reviews prepared by the leading scientists of England. It is a very full and instructive account. Historians of science will do well to make a note of it for future reference. G. S.

First International Congress for the Unity of Science.—In Paris, September 15-23, 1935, will take place the first International Congress

for the Unity of Science. The general aim of these congresses is to consider all questions relevant to the scientific enterprise as a whole, and in particular to make known and to further the logistic investigations of BERTRAND RUSSELL, the studies represented by the contributions to *Erkenntnis*, the writings of the *Wiener Kreis*, the metamathematical studies of DAVID HILBERT, the metalogic of the Polish school, the critical pragmatism of American thinkers, and all movements jointly sympathetic to the empirical habit of mind and a utilization of logical and mathematical techniques. The topics of the various congresses will be determined from time to time. Since a main task is to present the essential nature of the scientific venture and habit of mind ("the logic of science," "the logical syntax of the language of science," "unity of science," "scientific empiricism," and the like) the first congress is to be dedicated to the philosophy of science.

A preliminary congress concerned with laying plans for the first International Congress was held in Prague, September, 1934. The report of the preliminary congress is available in the journal *Erkenntnis*, or in book form from FELIX MEINER (Leipzig). At that time a temporary committee of organization was formed with the following membership: CARNAP (Prague), FRANK (Prague), JØRGENSEN (Copenhagen), LUKASIEWICZ (Warsaw), MORRIS (Chicago), NEURATH (The Hague), REICHENBACH (Istanbul), ROUGIER (Cairo), SCHLICK (Vienna). A Permanent Committee is in process of formation, and acceptances to membership have been received from BRIDGMAN, CARTAN, ENRIQUEZ, FRÉCHET, PAUL GAUTIER, HADAMARD, PIERRE JANET, KOTARBINSKI, LASHLEY, C. I. LEWIS, C. NICOLLE. When completed the committee will be representative of all the main fields of science.

Correspondence may be addressed to the Secretary, Dr. OTTO NEURATH, Mundaneum Institute, 267 Obrechtstraat, The Hague, Holland.

(University of Chicago)

CHARLES W. MORRIS.

Union académique internationale.—The sixteenth annual meeting of the Union Académique Internationale was held in Copenhagen, on invitation from the Royal Danish Academy of Sciences and Letters, on May 13-16, 1935. It was attended by delegates of fourteen countries, those of the United States of America (American Council of Learned Societies) being Dr. WALDO G. LELAND of Washington, D.C., and Professor WILLIAM A. NITZE of the University of Chicago. The meeting was marked by the unanimous election of the German Academies (Berlin, Leipzig, Heidelberg, Göttingen, and Munich) and of the Academy of Vienna to affiliation with the Union.

Académie internationale d'histoire des sciences.—Liste des membres de l'Académie au 10 février 1936, groupés par pays suivant la nomenclature et l'ordre adoptés dans les statuts. Les noms des membres sont donnés par ancienneté.

France. Membres effectifs : REY, Mme METZGER, WICKERSHEIMER, BRUNET, BRUNSCHVICG.

Membres correspondants : CARRA DE VAUX, CAULLERY, DELAUNAY, LAIGNEL-LAVASTINE, GUINET, THUREAU-DANGIN, Mme BESSMERTNY.

Allemagne. Eff. SUDHOFF, FELDHAUS, v. LIPPMANN, RUSKA, DIEPGEN, DINGLER.

Corr. DARMSTAEDTER, DRIESCH, TROPFKE, SCHUSTER, ZINNER, STICKER, VOGEL, HELLMANN, KOCH, MITTVOCH.

Grande-Bretagne. Eff. SINGER, HEATH, STEELE, WALEY SINGER.

Corr. GUNTHER, HOLMYARD, D'ARCY THOMPSON, STAPLETON, DICKINSON, FOTHERINGHAM.

Italie. Eff. MIELI, LORIA, ALMAGIÀ, ENRIQUES, BORTOLOTTI.

Corr. NALLINO, CORSINI, MARCOLONGO, GIORDANO, CASTIGLIONI, GLIOZZI, VACCA.

États Unis d'Amérique. Eff. SARTON, SIGERIST, THORNDIKE, SMITH, HASKINS, KARPINSKI, ARCHIBALD.

Corr. WRIGHT, TEMKIN.

Amérique du Sud. Corr. REY PASTOR, PAOLI (Argentine).

Russie. Corr. BLOCH, STRUVE.

Espagne. Eff. ASÍN PALACIOS.

Corr. SÁNCHEZ PÉREZ, BARREIRO, MILLÁS VALLICROSA.

Suisse. Eff. REYMOND.

Corr. TSCHIRSCH, KLEBS, SENN.

Pologne. Eff. DICKSTEIN.

Corr. BIRKENMAJER, SZUMOWSKI.

Belgique. Eff. BIDEZ.

Corr. VER EECKE, PELSENEER, ROME, TRICOT-ROYER, VAN SCHEVENSTEEN.

Pays-Bas. Corr. DE LINT, DE WAARD.

Tchécoslovaquie. Eff. RÄDL, VETTER.

Corr. NÉMEC.

Suède. Corr. LAGERCRANTZ, NORDSTRÖM.

Danemark. Corr. HAMMER JENSEN, NEUGEBAUER.

Hongrie. Corr. GYÖRIE.

Autriche. Eff. NEUBURGER.

Corr. HAAS, STRUNZ.

Maroc. Eff. RENAUD.

Roumanie. Eff. SERGESCU.

Corr. BOLOGA.

Grèce. Corr. STEPHANIDES.

Indes. Corr. DATTA.

Japon. Corr. MIKAMI.

Chine. Corr. WU LEH-TIEN.

Canada. Corr. McMURRICH.

Portugal. Eff. VASCONCELLOS.

Corr. de CARVALHO, JORGE, MONTEIRO.

Égypte. Eff. MEYERHOF, ISSA BEY.

Palestine. Corr. BODENHEIMER.

La réunion annuelle de l'Académie aura lieu en 1936 du 13 au 16 avril, à Bucarest, à l'occasion de l'assemblée du Comité international des sciences historiques. Les membres qui veulent y participer sont priés d'écrire au plus vite (s'ils veulent bénéficier des avantages offerts) à M. P. SERGESCU, prof. à l'université de Cluj.

Personalia.—(*Members of the H.S.S. are requested to send items for this section directly to M. L. GUINET, 11 Place Général Meiser, Brussels, Belgium.*)

At the 299th commencement of Harvard University in Cambridge, Mass., on June 20, 1935, Dr. GEORGE SARTON was admitted to its degree of Doctor of Laws.

The beautiful portrait of Dr. HARVEY CUSHING which appeared in frontispiece of vol. 24, was not sufficiently explained, the note relative to it having been dropped by the printers.

It is a photograph taken by Dr. RICHARD U. LIGHT, "the flying surgeon", near the entrance to Dr. CUSHING's old office in the Peter Bent Brigham Hospital, Boston, and kindly presented by him to *Isis*.

Reviews

Leona Baumgartner and John F. Fulton.—*A bibliography of the poem Syphilis sive morbus Gallicus by GIROLAMO FRACASTORO of Verona.* 157 p., 9 fig., frontispiece. New Haven, Yale University Press, 1935. (\$5).

One of the authors of this book, Dr. JOHN FARQUHAR FULTON, Sterling professor of physiology in Yale University, is already favorably known in historical circles by various studies on the history of physiology and the history of science in general, and he has placed himself in the first rank of scientific bibliographers with his very valuable *Bibliography of ROBERT BOYLE* (Oxford, 1932; *Isis* 19, 204; Supplement, Oxford, 1933; *Isis*, 23, 511).

On account of the multiplicity and intricacy of BOYLE's publications, FULTON's bibliography of them was an important contribution to the history of science in the seventeenth century, a tool which the earnest student of that period cannot afford to neglect. The present volume will appeal to a different kind of reader, largely to the growing class of medical humanists and dilettanti, sentimental and temperamental bibliographers, whose master and guide is the late Sir WILLIAM OSLER (*Isis* 8, 358-61). I do not mean to say that other scholars will not appreciate it, but they will not read it in the same way as they read the former book.

The work has been done exceedingly well. The authors began in the right way by publishing a check list (28 p., Oxford Press, 1933) which enabled them to continue their inquiries far more thoroughly. Grouches may say that there are a hundred or a thousand books which would deserve such laborious investigations far more than *Fracastorū Syphilis*, but let them grouch. In the course of time every scientific text will be dealt with in the same way, and it does not matter so much if the order in which they are considered is not that of scientific importance but rather that of public curiosity. *Habent sua fata libelli!* The essential is that the work be done as well as possible, and the present volume seems to be a model of its kind.

Judging by the number of its editions, the *Syphilis* was an important book, a moulder of public opinion, the source whence a great many

laymen and even doctors derived their views on the subject. Moreover it is one of the greatest poems in the post-classical Latin literature, one of the outstanding classics among the books which are primarily literary productions though devoted to scientific topics. The first edition appeared at Verona 1530, and nine other Latin editions had already appeared in four other cities before FRACASTORO's death in 1553. There are in all 45 Latin editions (from 1530 to 1830), 29 in Italian (1585 to 1930), 13 in English (1686 to 1935), 9 in French (1753 to 1872), 6 in German (1827 to 1907), one in Spanish (1863), one in Portuguese (1883), a grand total of 104 editions spread over four centuries.

The chronological distribution of these editions is as follows :

1530-50,	10	}	20	XVIII(1),	17	}	24
XVI(2),	10			XVIII(2),	7		
XVII(1),	8	}	15	XIX(1),	21	}	35
XVII(2),	7			XIX(2),	14		
				1901-35,	10		

The revival of interest of the English world in FRACASTORO is evidenced not simply by the present book, but also by Mrs. WILMER CAVE WRIGHT's edition and translation of the *De contagione et contagiosis morbis* (1546)—a far more important work than the *Syphilis* though far less popular—and by no less than five English editions of the *Syphilis* : St. Louis 1911, Toronto 1928, St. Louis 1931, Los Angeles 1934, London 1935. The last mentioned edition, a prose translation by HYNNEAGE WYNNE-FINCH with abundant notes, is particularly valuable; as is Mrs. WRIGHT's edition of the *De contagione* (New York, 1930; *Isis* 16, 138-41). And that is not all, for we understand that Prof. G. L. HENDRICKSON of Yale University is engaged in making a new translation of the *Syphilis* in English verse. The same author published recently an interesting study on the origin and history of the word syphilis (1934; *Isis* 24, 216).

To return to this bibliography, the technical description of each item has been made in the most fastidious manner, and the authors have added many critical notes and short biographical notices of all the scholars responsible for those many editions and translations. Their book is thus a "who's who" of the Fracastorians of the world!

I would venture to criticize it only on two grounds. In the first place, in the case of a minor author like FRACASTORO I believe it would be more expedient, having gone so far, to complete the bibliography and include in it the MSS. and the editions of other Fracastorian writings. This could have been done without increasing the task and the expense considerably. In the second place, section VIII, Biography and criticism, would have been improved by leaving out some general works. Of

course every history of medicine, every history of astronomy, every history of science, every history of the sixteenth century may be expected to deal with FRACASTORO, but such works should be included only if they add to the subject something not found in monographs.

The book is beautifully got up, a credit to the Yale Press as well as to the authors. The illustrations are fine. I was especially interested in the frontispiece, a bust by DANESE CATANEO in the Vienna Hofmuseum which is supposed to represent GIROLAMO FRACASTORO. The book is dedicated to ARNOLD C. KLEBS of Nyon, which is amply justified on general grounds, and also on special grounds, for Dr. KLEBS has provided an introduction written in the best Oslerian manner, a splendid addition to the literature of medical humanism.

GEORGE SARTON.

Nicolas Copernic.—*Des Révolutions des Orbes Célestes*. Traduction, avec introduction et notes, par ALEXANDRE KOYRÉ. VIII+156 pp. ALCAN. Paris, 1934 (18 fr.).

This little work is a welcome addition to our studies of COPERNICUS. It presents text and translation of some minor writings and of the first eleven (1) chapters of the first book of the *De Revolutionibus Orbium Caelestium*. In a lively and brilliant introduction (2) KOYRÉ maintains that COPERNICUS believed in real spheres which carried the planets. To employ DUHEM's terminology, he was a physical, and not a mathematical, astronomer.

Because KOYRÉ correctly apprehends this central idea, his translation is a considerable improvement over MENZZER's (3), which is otherwise excellent but is marred by a misunderstanding of the sphere doctrine. The English translation (4) of selections from the first book is unreliable; the Polish translation (5) is useless to most Western readers. Hence, KOYRÉ's translation is of the first importance for the student of COPERNICUS; and it becomes the duty of the reviewer to call attention to its few errors and questionable renderings.

Before these are considered, however, the quality of the Latin text

(1) not twelve, as KOYRÉ states (VIII).

(2) which appeared separately in *Revue Philosophique de la France et de l'Étranger*, 116, 1933, 101-118.

(3) C. L. MENZZER "Nicolaus Copernicus, Ueber die Kreisbewegungen der Weltkörper" 1879. The year of publication is given inaccurately by KOYRÉ (4, note 2).

(4) HARLOW SHAPLEY and HELEN E. HOWARTH "A Source Book in Astronomy", 1929, pp. 1-12.

(5) "NICOLAI COPERNICI ... de Revolutionibus orbium caelestium ... Edidit J. BARANOVSKI" Warsaw, 1854.

which KOYRÉ offers must be noted. He states (VIII) that he has followed the text of the now classic Thorn edition of 1873; but he has permitted his volume to appear with numerous misprints. This defect is especially regrettable since his is the only easily accessible text; the older editions are rare and expensive.

I turn now to a consideration of errors in KOYRÉ's translation. The gravest of all occurs in his version (44) of a passage from PLUTARCH. οἱ μὲν ἄλλοι μένειν τὴν γῆν, Φιλόλαος δὲ Πυθαγόρειος κύκλω περιφέρεσθαι περὶ τὸ πῦρ κατὰ κύκλου λοξοῦ he renders by "D'autres cependant pensent que la terre se meut; ainsi PHILOLAUS le Pythagoricien dit qu'elle se meut autour du feu en un cercle oblique." KOYRÉ simply repeats MENZZER's mistranslation (6) "Andere aber glauben, die Erde bewege sich: so sagt PHILOLAUS, der Pythagoräer, sie bewege sich um das Feuer in schieferm Kreise" (italics mine).

There are certain other passages in which KOYRÉ follows MENZZER's false rendering. 1. *medios* (59, last line): this word means, not "ceux... qui vivent au milieu," "die dazwischen Wohnenden," but 'eclipses occurring in the middle of the day, between morning and evening.' KOYRÉ's misunderstanding of the passage leads him to remark of it "Phrase qui, visiblement, n'a aucun sens" (142, note 1 to ch. II).

2. *multa et longa observatione* (45, line 4): KOYRÉ writes "par de longues et nombreuses observations," following MENZZER's "durch viele und lange fortgesetzte Beobachtungen" (7). Now while *observatio* regularly has the meaning of 'observation,' it cannot have that meaning in this passage, where its sense is to be rendered by 'study, application' (cf. *observandis* 49, line 4). KOYRÉ should have seen this, for he states (7) that COPERNICUS made only 27 observations in all.

3. *Si igitur et terra faciat alios, utputa secundum centrum* (101, last two lines): KOYRÉ writes "Si donc la terre faisait aussi d'autres (mouvements) qu'autour de son centre," following MENZZER's error "Wenn also auch die Erde andere Bewegungen, als diejenige um ihren Mittelpunkt besitzt" (23). The words should be translated 'If, then, the earth too moved in other ways, for example, about a centre.'

4. *rationibus* (53, line 12): this word means, not "calculs," "Berechnungen" (MENZZER, 10), but 'ideas, conceptions.' COPERNICUS' term for 'calculations' is regularly *numeri*. KOYRÉ here follows MENZZER in this error; but elsewhere he avoids it, e.g., *geometrica ratio* (65, line 1): MENZZER's "nach geometrischer Berechnung" (13) is wrong, KOYRÉ's "des raisons géométriques" is right; *rationem* (72, last line) and *ratione* (76, line 11) are other examples.

There are several passages in which KOYRÉ departs from MENZZER's accurate translation and thereby falls into error.

1. *ex quadringentorum et amplius annorum observatis* (54, lines 4-5) : this phrase is given by KOYRÉ as "à l'aide d'observations de quarante et plus années," while MENZZER had correctly written "mit Hülfe der Beobachtungen von vierhundert und mehr Jahren" (10).
2. *motus aliquos diversos* (41, line 8) : "plusieurs et divers mouvements." KOYRÉ has missed the technical term *motus diversus* = motion of inequality, though MENZZER saw it and wrote "einige ungleichmässige Bewegungen" (6).
3. *relegerem* (43, line 12) : KOYRÉ misses the force of *re-*; not "lire" but "von Neuem zu lesen" (MENZZER, 6) is right.
4. *de divinis mundi revolutionibus* (50, line 5) : not "révolutions du monde divin," but "himmlischen Kreisbewegungen der Welt" (MENZZER, 9).
5. *crassitudine submissa* (66, line 2) : not "s'élargissant," but "mit abnehmender Dicke" (MENZZER, 13).
6. *inter mota aequaliter ad eadem* (73, lines 7-8) : "lorsque les mobiles... sont animés d'un mouvement égal" is not adequate; for in addition to equal velocity, motion in the same direction (in gleicher Richtung) is intended.
7. *Eorum vero, quae differentia rerum absolvit* (83, lines 5-6) : "entre les choses séparées par une diversité de nature" is wrong. MENZZER was right in taking *quae* with *ratio*, which follows, and *absolvit* in its regular sense of 'explain' or 'settle a question' (cf. *absoluta* 73, line 4).
8. *quid ex terrenis partibus* (95, line 13) : not "quelqu'une des parties terreuses," but "etwas aus erdigen Theilen Bestehendes" (MENZZER, 21).
9. *Tanta* (118, line 10) : not "Tellement parfaite," but "So gross" (MENZZER, 28), for COPERNICUS is emphasizing here the enormous remoteness of the fixed stars.

There are other inaccuracies in translation that require notice. Sometimes essential words are omitted : *atque orbium* (46, line 4), *undequaque* (62, line 6), *grandescens* (128, line 9). *circuire* (93, line 5) does not imply, as KOYRÉ supposes, rotation about the earth. *terrea aqueave materia permixtus* (94, line 1) should be "mêlé de matière terrestre ou (not et) aqueuse."

sedula observatione sectantibus ipsum cognitus (117, lines 11-12) has somehow become negative "ne le découvrant pas par une observation attentive à l'aide de sextants." Perhaps 'que' was intended for 'pas.'

While properly denying the existence of Newtonian gravitation in the thought of COPERNICUS, KOYRÉ slips into error (21, note 1; 146, note 2 to ch. IX) when he speaks of "la tendance des semblables à se

réunir." It is not *likes*, but *parts* that strive toward spherical unity (*partibus* 101, line 6). Hence the faulty translation of *hac (forma) universa appetant terminari* (56, last line) where *universa* means not "toutes choses" or "Alles" (MENZZER, 11) but "Touts," 'Wholes' (cf. 98, line 1).

For *sex signa semicirculum apparentia terminant* (79, last two lines) KOYRÉ writes "six signes (du Zodiaque) limitent les (astres) apparents", omitting *semicirculum* which is essential to the argument. MENZZER's "sechs Zeichen den Halbkreis bestimmen" (17) omits the equally essential *apparentia*. What is needed is 'the six visible signs (of the zodiac) form a semicircle.'

The most curious error of all is found on page 131. KOYRÉ used the text of the Thorn edition, apparently without reference to its *Addenda et Corrigenda*. Thus, he has not replaced *seminaverunt* by *somniaverunt*, and is therefore compelled to resort to a rather imaginative translation. His difficulty is especially puzzling, since MENZZER has the matter right (note 38).

It is not easy to understand on what grounds KOYRÉ is certain that the universe of COPERNICUS is finite (23; 147, note 17). Several passages deal with this question (81, lines 4-8; 84, lines 1-4; 90, line 9-92, line 9). COPERNICUS follows the Aristotelian tradition in arguing (91) that the infinite must be immovable. Now since the highest sphere, in COPERNICUS' system, is motionless (115), there is no reason why it cannot be infinite. But COPERNICUS regards the question whether the universe is finite or infinite as one not proper to astronomy, but rather to speculative philosophy: *Sive igitur finitus sit mundus, sive infinitus, disputationi physiologorum dimittamus* (92). He rather inclines to the view that it is infinite: *mundum videlicet sphaericum immensum, similem infinito* (Thorn edition, 36, lines 10-11 of the notes), but avoids the direct statement because he wishes to avoid the traditional difficulties of the infinite (91).

Some factual statements in the Introduction need correction. COPERNICUS became an orphan at the age of ten, not twelve (5). The first edition of the *Narratio prima* was brought out, not by SCHONER (10), but by RHETICUS; the second, by GASSARUS (11).

The detailed examination to which KOYRÉ's book has been here submitted has perhaps obscured its essential soundness and high importance for the history of science. Despite its faults, it is a valuable contribution to our understanding of COPERNICUS.

(College of the City of New York.)

EDWARD ROSEN.

Margaret Sherwood Libby.—*The attitude of VOLTAIRE to magic and the sciences.* 299 p. New York, Columbia University Press, 1935. (\$3.75).

The diffusion of scientific knowledge represents an integral part of the history of science. As scientific ideas spread, either among different strata in the same society or to different cultures, they are often subject to simplification or distortion; also, they may be invoked for such non-scientific functions as supporting racial myths or controverting religious conceptions. Dr. LIBBY's volume is to be welcomed as a considerable contribution to the understanding of this phase of the history of science.

Despite the imposing historical stature of VOLTAIRE, he was, so far as his attitudes toward science and magic are concerned, largely representative of the French intellectual élite of his day. It was at the height of the popularity of natural philosophy in France when FONTENELLE'S Cartesian *Pluralité des mondes* and ALGAROTTI'S *Le Newtonisme des dames* were the vogue—that VOLTAIRE evidenced his most marked interest in science. With his *Lettres philosophiques* (1733) and his *Éléments de la philosophie de Newton* (1740), VOLTAIRE, though possessed of but a modicum of scientific training, sanguinely essayed to popularize science. In these works he summoned all his stylistic charm to enliven the 'dry subject' in hand, ignoring 'geometric details' and writing "for those who having no time to emphasize these matters, still have a spirit clear enough to comprehend the result." It is to this dilettante audience that VOLTAIRE introduced NEWTON'S doctrines, which is a far cry from the oft-repeated statement (e.g., by W. C. D. DAMPIER-WHETHAM) that VOLTAIRE was the first to make NEWTON'S work known in France. MAUPERTUIS, among others, had not only spread Newtonian physics in France, but had instructed VOLTAIRE himself.

VOLTAIRE'S ideas concerning scientific method were vague, diffuse and unsystematic. He adopted NEWTON'S familiar dictum, *hypotheses non fingo*, interpreting it to mean, in accordance with NEWTON'S later usage, that "an hypothesis even if it explains every thing ought not to be admitted." This bold empiricism is quite congenial to his radical positivism, which also expresses itself in the opinion (later echoed by LOMBROSO and PARETO) that NEWTON'S remarks on the Apocalypse are those of one ready for Bedlam.

VOLTAIRE'S catholicity, or more precisely, lack of discrimination in scientific matters, was characteristic of the contemporary polite society. In biology, he neglected the work of LINNAEUS, HALLER, LYONNET and BONNET, just as he ignored the investigation of Newtonian problems by D'ALEMBERT, CLAIRAUT and EULER. He explained the presence of marine fossils in the Alps by suggesting that travelers or pilgrims may have dropped them—this, two hundred years after PALISSY. He accepted the current belief that a mother's fears during pregnancy print on this fetus the mark of the object terrifying her, despite the criticism of the

belief by contemporary scientists. On the one hand, he was an early champion of variolation, and on the other, he announced that small-pox "is communicated not only by touch and by the air but (also) by the imagination."

His attitude toward magic is, as one might expect, that of the confirmed rationalist. Magic is due to the machination of individuals selfishly impelled to keep man in ignorance. His conviction that belief in the efficacy of magic was dispelled by the discovery of its errors is a typically positivistic 'explanation' which persevered sufficiently to be found in FRAZER's *Golden Bough*. This theory of course disregards the fact, so well attested by anthropological research, that the pragmatic successes of magicians were many and that failures were easily rationalized by affirming an error in technique or the interference of some hostile power. In common with the educated men of his period, VOLTAIRE does not understand the frequently facilitative rôle of magic in the development of science. He adopts the same rationalistic attitude toward magic which had already found expression in the works of BAYLE and FONTENELLE.

One wishes that Dr. LIBBY had enlarged the purview of her study to include VOLTAIRE's attitude toward, and contribution to, historiography. As TROELTSCH and SCHEVILL have shown, VOLTAIRE's *Essai sur l'histoire générale et sur les mœurs et l'esprit des nations*, if it did not initiate, accelerated the development of positivistic cultural history. In his more Newtonian moments, he viewed historical change as mechanistically determined on the assumption that "it would be very singular that all nature, all the planets, should obey eternal laws, and that there should be a little animal, five feet high, who, in contempt of these laws, could act as he pleased, solely according to his caprice." In spite of his realization of the importance of intellectual history, however, he intermittently reverted to anecdotal exposition.

Dr. LIBBY's essay presents a lucid, amply documented analysis of her subject. There is a twenty-one page bibliography and a brief index.

Harvard University.

ROBERT K. MERTON.

Pierre Brunet and Aldo Mieli.—*Histoire des sciences. Antiquité.*

Avec cent-neuf figures dans le texte. 1224 p. (Bibliothèque scientifique). Paris, PAYOT, 1935 (200 francs).

Nous avons longtemps attendu cet ouvrage à la préparation duquel notre ami MIELI s'est consacré depuis de nombreuses années : plus d'une décade, car son *Manuale di storia della scienza. Antichità* (Roma, 1925; *Isis* 8, 578) en était en quelque sorte l'ébauche. Nous sommes heureux qu'il soit enfin publié grâce à la collaboration de PIERRE BRUNET,

et plus heureux encore de ce que notre long espoir ne soit pas déçu. Disons tout de suite que le livre est excellent; de beaucoup le meilleur dans son genre non seulement en français mais dans n'importe quelle langue.

De l'anthologie de 1925 est né un livre où les extraits occupent encore une place très importante, mais cette fois subordonnée au texte original.

" Nous nous sommes constamment laissé guider " disent les auteurs (p. 18) " par le souci de faire comprendre au lecteur l'évolution des connaissances et des théories scientifiques, tout en lui faisant connaître l'ambiance et la manière de raisonner propres à chaque époque importante. Il nous a semblé que ce résultat pouvait être obtenu en réunissant trois éléments d'étude : un exposé historique concernant l'évolution des connaissances et des théories scientifiques, ainsi que les travaux des divers savants, avec quelques notes biographiques indispensables,— un choix de passages tirés des différents ouvrages non pas seulement des savants les plus remarquables, mais encore de ceux qui, tout en étant de deuxième ou même de troisième ordre nous révèlent une tendance caractéristique de l'esprit de leur époque (même si cet esprit, au point de vue moderne, nous semble une véritable régression ou fait apparaître des principes erronés),— enfin une bibliographie indiquant, en plus de certaines éditions d'auteurs anciens, les principaux travaux des historiens modernes des sciences, susceptible par conséquent de permettre à la fois le recours aux meilleurs textes des auteurs cités, l'acquisition de notions plus complètes sur certains points brièvement notés dans ce manuel, et un travail personnel dans un domaine déterminé de l'histoire des sciences."

Le premier volume est consacré à l'« antiquité », ce qui veut dire ici, depuis la préhistoire jusqu'au VIII^e siècle de notre ère, c'est-à-dire jusqu'à l'époque où il faut commencer à tenir compte de la science arabe. Il est divisé en sept parties que je vais énumérer en indiquant la longueur de chacune d'elles :

I. Introduction. Science primitive (préhistoire, Egypte, Babylonie, en tout 90 p.). II. Science hellène (100 p.). III. ARISTOTE et son école (100 p.). IV. Époque alexandrine (258 p.). V. Débuts de la science gréco-romaine (182 p.). VI. Derniers grands savants de l'antiquité gréco-romaine, c'est-à-dire de PTOLÉMÉE à PAPPUS (186 p.). VII. Déclin de la science antique (158 p.).

Cette division n'est pas mauvaise, mais elle aurait pu être meilleure. Ce qui frappe au premier abord c'est que, comme il arrive souvent, les auteurs se sont un peu trop hâtés à écrire les premiers chapitres; ils sont devenus plus lents et plus circonspects à mesure qu'ils avançaient. Comment pourrait-on expliquer autrement qu'ils aient consacré 258 p. aux deux siècles alexandrins, alors qu'ils n'en ont donnés que 200 aux débuts et à l'âge d'or de la science grecque? En ajoutant les chiffres donnés plus haut, on voit que toute la science pré-Euclidienne est traitée en 290 p.; les deux siècles alexandrins en 258; la science gréco-romaine en 368! L'ouvrage eut été mieux équilibré si cette proportion eut

été renversée : env. 350 p. pour les débuts et l'âge d'or, 250 p. pour chacune des autres parties. La partie finale nous amène en 158 pages du IV^e au VIII^e siècle, et la fin est traitée un peu trop cavalièrement, — *desinit in piscem*. Le dernier auteur traité, BÈDE, qui mourut en 735 (il y a donc exactement douze siècles), est une personnalité beaucoup plus considérable que les auteurs ne nous l'indiquent, — une des plus grandes personnalités de tout le moyen âge.

Il est inutile de donner les titres des 55 chapitres du livre : cela prendrait beaucoup de place et serait assez peu utile. En effet l'histoire de la science antique est déjà assez connue en gros pour que les titres de ces chapitres puissent s'imaginer. L'ordre est, le plus souvent, chronologique; mais certains chapitres consacrés par exemple à l'alchimie, la cartographie, la technique militaire, couvrent des périodes relativement longues et qui se superposent. Le chapitre le plus neuf est celui consacré à PHILOPON, où l'auteur a pu tirer parti du mémoire récent de MAX MEYERHOF (1931; *Isis* 18, 447-48).

La méthode de MIELI consiste à faire suivre son résumé historique d'extraits choisis. Par exemple, les écrits hippocratiques sont représentés par 16 p., ARISTOTE par 26, PLATON par 5, THÉOPHRASTE par 12, EUCLIDE par 12, ARCHIMÈDE par 25, CELSE par 17, PLINE par 21, GALIEN par 17, PHILOPON par 10. Ces extraits sont accompagnés de notes nombreuses et fort instructives. Ils rendront sans doute de grands services aux étudiants. Malgré cela je ne puis partager tout à fait les illusions de mon vieil ami MIELI sur la valeur de cette méthode. L'idée mère — le retour aux sources — est excellente; mais c'est une naïveté (plus répandue en Amérique où les « source-books » sont nombreux, qu'en France) de s'imaginer qu'une anthologie, si bonne qu'elle soit, soit un vrai retour aux sources. En effet, la sélection des extraits est d'autant plus arbitraire que la mine est plus riche, et la science antique est une mine infiniment riche.

On ne saurait répéter trop souvent, en particulier aux jeunes étudiants, que l'emploi d'une anthologie, fut-elle la meilleure, ne constitue pas un vrai retour aux sources, mais est plutôt une sorte d'invitation à ce retour (1). On ne connaît pas ARISTOTE quand on en a lu 26 p.; il vaudrait sans doute mieux remplacer ces pages trop brèves par une synthèse qui en résumerait mille. De plus tous ces extraits doublent le volume de l'ouvrage, et aussi son prix. Il est à remarquer que l'idée enfantine de l'anthologie a graduellement disparu d'autres domaines, telles que l'histoire de la littérature, à mesure qu'ils étaient mieux exploités. Enfin

(1) J'ai déjà exprimé ces idées plusieurs fois, par exemple à propos de la mauvaise anthologie de SHAPLEY (1929; *Isis* 13, 130-134) et de la très bonne anthologie de D. E. SMITH (1929; *Isis* 14, 268-70).

l'aspect « anthologie » de ce livre admirable en diminue l'internationalité. Je puis recommander à mes élèves américains de lire un livre ou un chapitre français sur ARISTOTE, mais je ne puis pas du tout leur demander de lire des extraits d'ARISTOTE en français. Tout d'abord je leur ferai lire un livre entier; mieux vaut un livre complet que des extraits de dix; ensuite ils devront le lire en grec, ou si cela n'est pas possible, en anglais. Si l'usage d'une traduction est inévitable, il faut éviter à tout prix la double déformation qu'entraînerait l'introduction d'une troisième langue.

A mon avis les seules anthologies de l'histoire des sciences qui soient justifiables sont celles dont le but est en partie linguistique, c'est-à-dire de familiariser les étudiants avec une littérature scientifique déterminée. Un beau modèle du genre nous fut donné il y a longtemps par ULRICH VON WILAMOWITZ-MOELLENDORFF (1848-1931) dans son *Griechisches Lesebuch* (2^e éd., Berlin, 1902) et j'ai eu récemment le plaisir d'annoncer la publication de l'anthologie arabe de R. BLACHÈRE (Paris, 1932; *Isis* 24, 447-49). En effet de tels ouvrages sont particulièrement précieux pour les langues orientales dont l'apprentissage est difficile.

Mais je ne veux pas insister là-dessus. Dans son genre le livre de nos amis BRUNET et MIELI est ce que nous avons de mieux aujourd'hui. Il est digne de l'Académie que MIELI a fondée et dont il servira à étendre le prestige. Je suis sûr qu'il activera l'organisation de l'enseignement (car celui-ci est difficile sans bons manuels) et qu'il amènera à nos études les nouvelles recrues, bien disciplinées, dont nous avons besoin, car l'œuvre d'exploration et de défrichement qui reste à accomplir est immense.

GEORGE SARTON.

R. Blachère.—*Extraits des principaux géographes arabes du moyen âge.* 392 p. (*Bibliotheca arabica*, publiée par la Faculté des Lettres d'Alger, VII). Paris, GEUTHNER, 1932 (30 francs).

The great Dutch orientalist, MICHAEL JAN DE GOEJE (1836-1909), gave us in 1907 in the *Semitic studies* edited by RICHARD J. H. GOTTHEIL and MORRIS JASTROW, jr. a precious little volume entitled *Selections from Arabic geographical literature* (124 p., Leiden, 1907) which has been used by many classes of Arabic tyros. We are now offered by R. BLACHÈRE, Professor in the Institut des hautes études marocaines in Rabat, a book of a similar kind, though more ambitious.

Arabic literature includes four kinds of geographical writings, which are called respectively: 'ilm al-aṭwāl wal-'urūd (knowledge of longitudes and latitudes), 'ilm taqwīm al-buldān (knowledge of geographical tables), 'ilm al-masālik wal-mamālik (knowledge of roads and kingdoms), and 'ilm 'ajā'ib al-buldān (wonders of the world). The writings of the first two kinds fall largely within our modern category of "mathematical

geography" and do not lend themselves easily to quotation, especially in an anthology meant for reading purposes. The last two correspond to the more popular and broader conception of geography and cover the whole gamut of geographical description, from the account of separate journeys to the pilgrim's itinerary or the book of marvels, or on the other hand to the more scientific and philosophical presentations. BLACHÈRE's book illustrates very well the great variety of that literature. It contains fifty-three extracts from some twenty authors (there were only nine extracts from nine authors in DE GOEJE) (1), divided into three periods: I. 864 to 936; II. IXth to XIIth centuries; III. XIth century and following. These sections overlap somewhat, for in the editor's mind they are meant to represent not so much chronological periods, as psychological stages in the development of geographical literature. I. The beginnings of two kinds: compendia for secretaries, and books for the "general" reader; II. The blossoming out of these original kinds; III. Final evolution. The latest authors represented are IBN BATTŪṬA and the Berber ABŪ SĀLIM 'ABDALLĀH IBN MUḤAMMAD AL-'AYYĀSHĪ (1628-79) who travelled extensively to accomplish the Pilgrimage and to acquire knowledge.

For each author, the editor gives the main biographical facts, together with indication of the edition which has been followed, and brief bibliographical references. Those references are unfortunately of the most obvious kind, that is, the least necessary, for acquaintance with BROCKELMANN and with the *Encyclopaedia of Islām* might be assumed. References to new publications, which in many cases correct the *Encyclopaedia*, not to speak of BROCKELMANN, would have been more valuable. If too lazy to find such references by his own efforts, the editor could have easily obtained many of them in my *Introduction* or in *Isis*. For example, concerning the moot question BALKHĪ-İŞṬAKHRĪ-IBN ḤAWQAL, he should have quoted J. H. KRAMERS' important paper (1931, *Isis* 21, 352). With regard to AL-IDRĪSĪ the long account given in my *Introduction* (2, 410-412) was worth mentioning: it contains more indications for further study than any other account. Similar remarks might be made with regard to AL-MAS'ŪDĪ, AL-BIRŪNĪ, YĀQŪṬ, and AL-QAZWĪNĪ.

However it is clear that the author's purpose was not so much to increase our knowledge of Arabic geography as to furnish a convenient textbook for the use of students of the Arabic language. Looking at it from that point of view my first impression is most favorable. I have read enough of it here and there to convince myself that it is an

(1) DE GOEJE's authors are all included in BLACHÈRE, except, strangely enough, the geographer of Arabia, al-HAMDĀNĪ (X-1).

excellent Arabic reading book, which would offer an expert teacher abundant opportunities of explaining particularities not only of the language but of the culture and especially of the intellectual background. I very warmly recommend that it should be tried out for that purpose. Of course its real qualities (or defects) as a linguistic instrument will only become apparent after considerable usage, but I have the feeling that the editing has been done with due care. The notes are moderate in number and size, and to the point. The printing has been beautifully done by the Catholic Press of Beirût and the price is very reasonable.

The author was thus far unknown to me except for a paper on *SA'ID AL-ANDALUSI* (1928; *Isis* 17, 482); but the present volume will introduce him, I hope, to an increasing number of Arabists, young and old.

GEORGE SARTON.

Henry Crew.—*The Rise of Modern Physics*. Second edition. XIX+434 p.

The WILLIAMS & WILKINS Company, Baltimore, 1935. (\$ 4.00).

In this book the author surveys the history of physics up to and including the BOHR theory of the atom and the restricted theory of relativity. The term modern signifies that the emphasis is upon the development since GALILEO. The survey does not, however, include the so-called "new" physics of the recent past. The present book consists substantially of the emended first edition of 1928 supplemented by three additional chapters.

In the preface to the first edition the author stated that the book was intended for readers who have had little previous knowledge of the subject; in the preface to the new edition he states that he has especially had in mind the undergraduate entering upon the study of advanced physics. This well-written survey will be invaluable, however, to graduate students and teachers of physics, and to historians of science and logicians. The author combines history with systematic accounts of the several fields in a manner to exhibit the fundamental experiments, principles and methodology. The book contributes to one's deeper understanding of physics.

After a brief introductory chapter the book begins with an account of Greek and Roman science. The Greek period is divided into the Ionian school, the Pythagorean school and the school at Alexandria. The reviewer was surprised to find PROTAGORAS among the Ionians instead of in the company of SOCRATES and PLATO. There follow chapters on Arabian physics and the medieval period. An excellent feature of the book is the account of the contributions to mechanics by LEONARDO DA VINCI, CARDAN, TARTAGLIA, BENEDETTI, STEVIN, etc.

COPERNICUS and KEPLER make the transition to the creative seventeenth century, in which modern physics was born.

The author's detailed account of the contributions to mechanics by the great trio, GALILEO, HUYGENS and NEWTON, constitutes an illuminating survey of the principles of this fundamental subject. The history of mechanics concludes with an exposition of D'ALEMBERT's principle. The reviewer thinks that the formulation of this principle should be based, not upon the author's distinction between external and internal forces, but upon that between given forces and forces of constraint.

The history of optics concluding with the work of FRESNEL is adequately outlined in the following chapter. There is then interpolated a chapter on the pioneers of electricity and magnetism. Two chapters on the nature of heat and the discrete nature of matter give an account of the principles of thermodynamics and their kinetic-molecular interpretation. The history of electricity is then resumed in chapters on the development from VOLTA to OERSTED, on electromagnetism, on the origin of modern electrical units, and on the inertia of electricity. The reviewer was particularly impressed by Professor CREW's advocacy of the GIORGI system of units. There follows a chapter on the rise of modern spectroscopy, in which an admirable account is given of the work of FRAUNHOFER, KIRCHHOFF, ROWLAND, MICHELSON, etc. in the discovery and interpretation of phenomena, and the creation of spectroscopic apparatus and standards. The BOHR theory is presented with the fundamental mathematical detail. The final chapter of the book is a fairly adequate account of the restricted theory of relativity. The foregoing outline should suggest that the author's treatment, although laden with detailed accounts of discoveries, furnishes systematic surveys of the several fields of physics. The book is enriched with well-chosen quotations from original sources and abundant illustrations.

Sir JOSEPH LARMOR has been succeeded as Lucasian professor of mathematics at Cambridge (p. 134) by P. A. M. DIRAC. Professor S. J. BARNETT should be credited to the University of California at Los Angeles, rather than to the University of California without qualification (p. 322).

University of California, Berkeley.

V. F. LENZEN.

S. C. Gilfillan.—*Inventing the ship.* A study of the inventions made in her history between floating log and rotor ship. 294 p., 80 fig. Follett Publishing Company. Chicago, 1935.

This unusually significant book is a systematic study of some of the primary inventions essential to the development of sailing and power driven vessels. The galley is scarcely mentioned, and there is no explicit

treatment of the details of the transition from the galley to the sailing vessel. There are passages which seem to imply that some of these early developments of new appliances were hardly worthy of being classed as inventions. In so far as this opinion served as the basis for the limited scope of the discussion of the sailing vessel, it raises critical questions with reference to the theory of invention, but it must be confessed that the general reader will probably find the treatment of the sailing vessel wholly adequate to his needs. It is obviously impossible, however, in the course of fifty-three pages to deal comprehensively with the development of the ship from the third millenium B.C. to 1700.

The text is primarily concerned with the application of steam, the DIESEL motor, and the FLETTNER rotor. Attention is also given to recent developments in rudder design, and to some novelties of propulsion as yet restricted to small boats. Despite this severe process of selection, the material is so carefully handled that the volume is a most illuminating treatment of the development of ocean-going vessels. The early history of the application of steam is more adequately treated than in any of the older works. The recognition of the organic character of the process of innovation makes it possible to deal more intelligently with the relation of the different inventions to each other. MARESTIER's "Mémoire sur les bateaux à vapeur" has been rescued from obscurity and put to effective use. FULTON's work is more carefully described and more adequately appraised than in any of the older studies of this subject. The contributions of the STEVENS family are described with discriminating care. In conclusion, there is an excellent sketch of FLETTNER's work on rudders and on the famous rotor.

Much of the distinction of the volume is due to the interest of the author in the theory of invention. In its original form, as a doctoral dissertation, this material was an integral part of a study of the sociology of invention. The full discussion of the general theory is now issued as a companion volume, though the conclusions of the study are summarized in an appendix as a series of thirty-six principles. The history of the ship is thus designed to serve as a demonstration of the validity of the thirty-six principles.

The author shows a keen appreciation of the relative continuity of the process of innovation, so that he is entirely free from any trace of the transcendental concept of invention as an isolated and unconditioned act. The strength of the narrative in the present volume is wholly due to the skill shown in portraying these events as a cumulative process. But this consciousness of the process as a whole has obscured the explicit act of invention. The implications of the text and the formal statements of principle are confused. "What is called an important invention

is a perpetual accretion of little details, probably having neither beginning, completion, nor definable limits. . . It is an evolution, rather than a series of creations, and much resembles biologic process" (p. 275). "Everywhere we have seen, or been able to guess at a gradual evolution, or accumulation of quite little steps, never a revolutionary one, such as the 'invention of the steamship' would have been, had it ever taken place." (p. 103) Both of these passages recognize that there is a distinction to be made between the individual steps in the process and the process as a whole, but no attempt is made to give accurate expression to these implications. The reviewer has attempted to distinguish more sharply between these aspects of the process of innovation, and this study of the ship shows in many ways the desirability of pushing the analysis of the process to a point at which some explicit distinction is established.

If the analysis were thus pushed further, the author would certainly reach a different judgement upon two of the principles deeply imbedded in the sociological theory put forward. Principle 26 reads as follows: "There is no indication that any individual's genius has been necessary to any invention that has had any importance. To the historian and social scientist the progress of invention appears impersonal." The first proposition is probably sound, if one is to ignore entirely all problems of timing and development. The progress of science and invention is not entirely dependent upon the talents and capacities of unique individuals. But this proposition does not lead naturally to the second. The movement of history cannot be correctly described as impersonal, merely because something more or less similar would have happened even if a particular individual had not been present. The history of the steamboat as told in the present volume furnishes an excellent illustration of the significance of personality. FULTON's talents were probably inferior to STEVENS', but as Dr. GILFILLAN says so aptly, "FULTON had a patent on the Hudson River," and in consequence the Clermont forced the Phoenix to forsake New York waters for the less favorable Delaware River, despite the superiority of her design and equipment. The personalities of inventors cannot be deemed a matter of indifference, if they impress themselves upon events and give some special direction or color to the movement of history.

Dr. GILFILLAN holds also that invention is inevitable. "With the progress of the craft of invention, apparently a device can no longer remain unfound, when the time for it is ripe." Over a long period of time, it is doubtless true that all the various potentialities and combinations are tried out. But time is not a negligible feature of historical process. We must needs recognize that the effective rationalization

of social change requires us to explain or describe the course of events in the actual time sequence followed. It is not inevitable that the various combinations be tried out in a given order, nor is it inevitable that the intervals of time between successive events should follow any single pattern. Inventions are inevitable only in a restricted sense, and one will certainly lose contact with history if this concept of inevitability is pushed to its logical conclusion.

These difficulties are not very serious unless the analysis of the process of innovation is carried out in greater detail than is possible in the present study. The limitations in the scope of the study have thus failed to reveal certain weaknesses in general theory.

Harvard University.

ABBOTT PAYSON USHER.

Prince Youssouf Kamal.—*Quelques éclaircissements épars sur mes Monumenta Cartographica Africae et Aegypti.* Imprimés pour l'auteur par E. J. BRILL, S. A., Leiden, 1935. (Non mis dans le commerce.)

Through Prince YOUSSEUF KAMAL's generosity nine stately *fascicules* of the *Monumenta Cartographica Africae et Aegypti* have already been distributed to the leading libraries and Geographical Societies of the world. The first three *tomes* are now completed (see *Isis* 12, 393; 19, 562), except for the supplements, and the fourth is in preparation. The finished work (which should weigh at least a quarter of a ton) will have covered the history of cartography from the beginnings to modern times.

Two aims seem to have been envisaged by the Prince and Dr. WIEDER of Leiden, his chief collaborator; first, to make available a fairly complete corpus of materials for the history of geographical knowledge concerning Africa and Egypt, and second, to provide a selected group of documents illustrating the general history of cartography and cosmography. With these objects in view the relevant texts of Antiquity and the Middle Ages have been reproduced in the original tongues. A French translation is provided, and as an extra refinement the place-names in both versions are printed in red. Maps, both originals and modern reconstructions, are given in excellent facsimile, and one entire *fascicule* is devoted to modern maps depicting the Ancient World, an impressive series covering the last four centuries (*Atlas Antiquus*). In addition a large number of 19th century interpretations of classical geographical conceptions ("le monde d'après ERATOSTHÈNE," etc.), some of rather dubious authority, have been interspersed through the volumes. In general the editing has been reduced to a minimum, and maps and documentary sources are laid before the reader without commentary or criticism.

The value of Prince YOUSSEUF's *Monumenta* is indisputable. They

provide in a single collection much that is essential to the student of any aspect of the history of geography. It is no reflection on their worth to add that a large part of their content is available elsewhere, less compactly, indeed, and in widely scattered sources. The fact that the *Monumenta* have been given only a limited distribution will prevent them, however, from completely superseding the older works. (Washington, Chicago and New York alone have received copies in this country. Widener Library, largest University collection in the world, was unfortunately omitted from the list.)

Prince YOUSSEUF's *Eclaircissements*, the volume under review, has been distributed more widely than the *Monumenta*, themselves, and should help to call the attention of scholars to their usefulness. The title rather accurately describes the nature of the book, which is based on a series of lectures delivered before the Société Royale de Géographie d'Égypte in March and April 1935. In these lectures Prince YOUSSEUF seems to have had two purposes in mind. In the first place he has explained the plan on which the *Monumenta* have been executed, and has described the Supplements to Tomes I and II, and the *fascicules* of Tome IV which are still to be published. It is perhaps sufficient in this connection to quote the Prince's own words :

" J'aurai ainsi terminé mon ouvrage dont les grandes lignes de la Table des matières m'ont été dictées par l'histoire de la géographie et de la cartographie; un Manuel dont la destination est plutôt à l'usage du savant, du chercheur avancé, qu'elle ne l'est pour l'écolier commençant, et dont je fus l'architecte dessinateur et constructeur; et dont le Dr. F. C. WIEDER fut (et c'est d'après sa propre expression) le très éminent décorateur " (p. 202).

In the second place Prince YOUSSEUF has made a number of excursions into the history of geography and cartography, to demonstrate the value of the *Monumenta* in clarifying some of the important problems of the field. He first attacks the difficult question of the origins of cartography among primitive peoples, and without pretending to absolute finality, suggests a parallelism between the development of symbolical or pictorial maps and the evolution of the alphabet. He then proceeds to Tome II of the *Monumenta* which begins with the *Geographia* of PTOLEMY,—text, translation and selected facsimiles from important manuscripts. Prince YOUSSEUF examines the voluminous literature dealing with the origin of the Ptolemaic maps (the AGATHODEMON controversy), and reaches the all-too justifiable conclusion that

" jusqu'au XX^e siècle, tout ce qui a été dit des cartes attribuées à CLAUDE PTOLÉMÉE, de Péluse, le fameux géographe de la première moitié du II^e siècle après J.-C., est, à mon propre point de vue, un simple reflet de l'imagination et de la conviction individuelle qui ne peut donc être imposé comme une vérité irréfutablement positive." (p. 36)

The next two sections (Parts II and III) are devoted to an examination of medieval cartography. Part II, "Les Géographes Occidentaux," is based largely on the collection of the late Mr. MICHAEL ANDREWS of Belfast, which contained some 600 photographs of medieval world maps. Prince YOUSSEF was permitted to make a selection from these to be reproduced in his *Monumenta*. He makes no attempt at a scientific classification of his own, but prints in *résumé* a communication of Mr. ANDREWS of considerable interest.

Part III deals with the Oriental geographers who are magnificently represented by the facsimiles and reprints in Tome III of the *Monumenta*. The discussion centers on problems connected with the work of AL-BALKHI, AL-ISTAKHRI and IBN HAUQAL; the Prince was seconded in this study by the researches of J. H. KRAMERS of Leiden. Concerning the origins of the Arabian school Prince YOUSSEF is of the same opinion as those

"qui nous apprirent grâce à leurs recherches sur la géographie et la cartographie des Orientaux que ceux-ci commencèrent par l'astronomie ou la cosmographie, pour aborder ensuite la géographie" (p. 96).

It might have been added that this was also true, to a considerable extent, in the development of Western cartography during the later Middle Ages.

The fourth part of the *Eclaircissements* discusses the period of Portuguese discovery which is to be covered in the still unpublished Tome of the *Monumenta*. A special excursus is devoted to the problem of the origin of the portolan navigation charts, concluding,

"malheureusement, la vérité reste obscure quant à l'origine de ces cartes, bien que l'opinion qui les attribue aux Espagnols reste la plus forte" (p. 188).

It is easy to concur with the first half of this statement, but the second is rather more difficult to accept.

These remarks will suffice to indicate the general character of the volume. It may be hoped that through the *Eclaircissements* an increasing number of scholars will be led to make use of the material which Prince YOUSSEF's munificence has placed at their disposal.

Harvard University.

DANA B. DURAND.

William Thomas Corlett.—*The Medicine-Man of the American Indian and his Cultural Background.* ix+369 pp., frntsp. & 22 illust.
CHARLES C. THOMAS, Springfield, Ill., 1935. (Price \$5.00).

DOCTOR CORLETT, who is Professor Emeritus of Dermatology and Syphilology at Western Reserve University, has made a valiant effort to give a comprehensive picture of the medical ideas prevalent among the aborigines of the *whole Western Hemisphere* at the time contact

was made with the whites. The word "American" in the title is thus at last used by a resident of the United States of America in its true and proper sense. The scope of the work is indicated by the contents: Part I, The American Indian, His Origin and Culture: Racial Origin; Peopling of the New World; Cultural Divisions; Indian Diseases Past and Present; Religion, Medicine-Men and Disease. Part II, Medicine Men of the New World; The Arctic, Western and Eastern Eskimo, the Northwest Coast; The Plains, Blackfoot, Assiniboine, Crow, Omaha, Pawnee; The Northern Woodland, Ojibwa, Menomini, Eastern Algonkian, Iroquois; The Southern Woodland, Creek, Choctaw and Chicksaw, Cherokee; The Southwest, Ocoma, Navajo; Central America, Aztec, Maya; Antillean or West Indies; Colombia; Tropical Forest or Amazon Region; Peruvian or Inca Area; Patagonia. Part III, Childbearing. Part IV, Foods and Materia Medica. Part V, The American Indian's Recessional. Bibliography.

While the author modestly admits he has merely scratched the surface of his subject, he has made an excellent compilation in convenient book form of widely scattered material. He shows the fundamental similarities of medical practice among the new world aborigines and emphasizes that the "intertwining of the Indian's religious beliefs and rites with his practice of medicine are often found to be inextricable." Copious quotations from original observers add greatly to the historical value of the study. It is unfortunate that the author omits reference to and does not seem to be familiar with ERIC STONE's admirable *Medicine Among the American Indians*, *Clio Medica* VII, P. B. HOEBER, New York, 1932 (*Isis*, 19, 247-248). To the latter book, the present one makes a valuable companion volume, since it extends the scope of the survey to include the rest of America. For the sake of completeness, Doctor CORLETT's account should include reference to the investigations of FRANCISCO FLORES (*Historia de la Medicina en Mexico*, Mexico City, 1886-1888), NICOLAS LEON (*La Obstetrica en Mexico*, Mexico City, 1910), and the several Brazilian and Argentinian reports on native materia medica.

(University of California,
San Francisco.)

CHAUNCEY D. LEAKE.

Vilfredo Pareto.—*The Mind and Society* [*Trattato di Sociologia generale*, 1916]. Edited by ARTHUR LIVINGSTON. Translated by ANDREW BONGIORNO and ARTHUR LIVINGSTON with the advice and active coöperation of JAMES HARVEY ROGERS. 4 vols. (2033 pp.) New York, HARCOURT, BRACE, and Company, 1935 (\$20.00).

VILFREDO PARETO, of an old Genoese family, grandson of a marquis

of NAPOLEON's creation, son of a distinguished conspirator in the cause of a free, united, and republican Italy, was born in Paris in 1848. His father was an engineer, and he himself was trained as one, graduating from the Polytechnic Institute in Turin at the age of twenty-two. He practised his profession in Rome and in Florence for a few years and then settled in Florence to study economics. Several of his papers on the subject attracted wide attention, and in 1894 he was recommended by LEON WALRAS as his successor in the chair of political economy at the University of Lausanne. PARETO published two books on mathematical economics, *Cours d'économie politique* (1896-7) and *Manuale di economia politica* (1906), which were important not only in their own day but as forerunners of subsequent fruitful developments in economic theory. But PARETO recognized that economics, unless supplemented by an investigation of other social phenomena, could give but an unsatisfactory account of societies ancient and modern. He turned to the study of what is called sociology. The eventual result was the *Trattato di Sociologia generale*, which appeared first in 1916 and in a French translation a year later. *The Mind and Society* is its first English translation. PARETO died in 1923.

The Mind and Society opens with a chapter in which PARETO discusses the more general rules of method which have been found expedient in scientific investigations. These rules, he states, will be followed in his book. Among other things, he will go forward by successive approximations. "That is to say, we shall first consider things as wholes, deliberately ignoring details. Of the latter we shall then take account in successive approximations" (§ 69). And *The Mind and Society* itself is but a first approximation toward a systematic study of societies.

The Mind and Society falls roughly into two parts, an inductive part and a deductive part. In the first part, through an assembly and classification of relevant facts, a certain number of uniformities among these facts present themselves. In the second part, inferences are drawn from these uniformities, and the inferences are compared with further facts. If these facts do not bear out the inferences, then the uniformities, the hypotheses from which they were drawn must be rejected. All this may seem platitudinous, but it is important to insist on such platitudes in a subject like sociology, which is not so mature a science that these things can be taken for granted, as they can in physics.

The conduct of men is an important factor determining the form of society. PARETO begins by dividing this conduct into two classes of actions, which he calls logical actions, and non-logical actions. Logical actions are actions the results of which are objectively and subjectively

identical. Non-logical actions are other actions. Thus when the seamen of Aeneas row their ships in order to reach the haven where they would be, their action of rowing is a logical action. That is, the result of the rowing is both subjectively, to the seamen, and objectively, to a detached observer, the accomplishment of the voyage. But when they sacrifice to the gods before putting to sea, theirs is a non-logical action. Subjectively, to the seamen, the result of the sacrifice is believed to be favorable winds and calm seas. Objectively, to the detached observer, the result is nothing of the sort.

A dichotomy of this sort, however vaguely expressed, is familiar in everyday life. Men are forced by the practical necessities of existence to accomplish a certain number of logical actions. In general, these are the actions—counting out mistakes—by which men gain food, clothing, shelter, pleasure, wealth, honor, and power. They are prominent in the activities we call business, industry, agriculture, engineering, strategy and tactics, the arts, and so on. On the other hand, typical non-logical actions, according to PARETO's scheme, are the practice of magic, observance of the cult of a religion, attachment to home and country, self-sacrifice, and so on.

Some people have found fault with PARETO's definitions of logical and non-logical actions. Granted that the distinction between the two cannot be applied to give a clear-cut result in every case, still the point is not an important one. For PARETO uses the distinction largely as a means of specifying what he is not going to talk about. The logical behavior of men has always been well understood, perhaps for the very reason that it is logical, and in modern times some logical behavior has been thoroughly studied, for instance in economics. Therefore PARETO says that he is not going to talk about it, at least for the moment. On the other hand, there is no good general study of non-logical behavior, and non-logical behavior is not only important in determining the form of human societies but indispensable to these societies. To this PARETO turns his attention.

Words men produce as well as deeds. As well as actions, PARETO divides some of the phenomena of language, theories, into the logical and the non-logical. Logical theories are those which are in accord with observed fact. Non-logical theories are other theories. In former times, non-logical theories were common in the physical and biological sciences, for example, the theory that since the circle is the perfect figure, the orbit of a planet must be a circle—a statement which is not confirmed by observed fact. The progress of the sciences in question has consisted largely in substituting logical theories for such non-logical ones. In contrast to the state of affairs in these sciences, non-logical theories

still are, as they have always been, common among the things men say about what they do, about human institutions, and particularly, common in what men say about their non-logical actions. For instance, there are such as : "The Germans are an Aryan race"; "Men are born free and equal"; "Virtue is rewarded and vice punished."

As has been explained, logical actions are those the results of which are objectively and subjectively identical. To be so, these actions must be based on an objective knowledge of the relevant facts. And since logical theories are theories which are in accord with the facts, actions based on inferences from logical theories are among the logical actions. Thus, actions based on inferences from NEWTON's laws of motion are likely to be logical. On the other hand, actions based on inferences from non-logical theories are likely to be non-logical, though they are not necessarily so. As a matter of fact, few non-logical actions are based on theories of any kind. But people like to invent non-logical theories and persuade themselves that the theories are logical and that many of their actions are simply the result of logical deductions therefrom.

The theories about men and their behavior in societies, may be considered under three heads, which must be kept distinct. First, one may ask about them : Are they in accord with observed fact, that is, are they logical or non-logical? Second, if they are not in accord with fact, why are they produced and accepted? Thirdly, are these theories useful to the societies in which they are current? PARETO asserts that a non-logical theory may well be very useful to society, a logical theory very harmful. Thus the theory that virtue is rewarded and vice punished is not borne out by the facts, but society could not exist as we know it without the sentiments expressed in some such theory and, perhaps, not without their expression as well. On the other hand, while PARETO's own theories are largely in agreement with the facts, he would have admitted that assent to his theories by the mass of men, supposing it possible, would be harmful to society.

PARETO takes up the first two of these questions immediately, postponing consideration of the third until later in the book. For this purpose he begins by describing the different theories men have propounded to the effect that the weather can be affected by the performance of certain acts. These include the belief that rain can be produced by magical rites, such as the firing of a gun, and so on. These theories are of course non-logical; they are not borne out by the facts. Why then are they produced and accepted? PARETO comes to the conclusion that it is because they correspond to and bring into play certain sentiments of men.

The theories of the ways of influencing the weather by magic fall

into two parts. There is a part (*a*) which is the sentiment that the weather can be affected by the performance of certain rites. This part corresponds directly with the non-logical behavior which is the actual performance of these rites, so that if the sentiment is known the behavior also is known. This part (*a*) is relatively constant throughout the theories. There is also a part (*b*) in which men give the reasons why they believe the performance of the rites to be efficacious in influencing the weather. Thus they may say that the firing of a gun shocks the rain out of the clouds. Experience shows that this part (*b*) of the theories is relatively variable. As well as in theories about the ways of influencing the weather, these parts (*a*) and (*b*) are to be found in many of the non-logical theories that men propound in connection with their other non-logical actions. PARETO calls the parts (*a*) *residues* and the part (*b*) *derivations*.

Even when men do not act logically, they want to make their actions seem logical. Often, too, they feel a need to disguise from others and from themselves the motives which in fact led them to accomplish a certain action. These sentiments the derivations satisfy: it is the process called by the psycho-analysts *rationalization*. A derivation sets up a god of the winds and one, furthermore, who is expected to act in the way a human being would act in analogous circumstances—the god, like the human being, is placated by a gift. In this way, the derivation makes the non-logical action, the sacrifice to calm the winds, look as if it were a logical action, that is, an action based on a calculation from observed fact. But the god is not observed fact, and the theory in which he appears is non-logical. Of course this statement leaves out of consideration many factors. For one thing, no one ever adopts or can adopt a derivation because he has in this manner consciously analyzed its function.

The residues are evidently a more important factor in determining the form of societies than the derivations, for experience shows that, given a residue, men never have any difficulty in finding a derivation to rationalize it. Furthermore, if for any one of a number of reasons a derivation connected with a given residue is destroyed, another appears to take its place, or two derivations may flourish side by side. For these reasons, the residues are more constant than the derivations, and the experience of scientists has been that constant phenomena are important phenomena. Everyone knows this is true of such things as a stable ratio among the chief currencies of the world. If the ratio changes, there is trouble. Says PARETO: "Science looks for the constant parts of phenomena in order to reach the knowledge of uniformities." (§ 218).

The early part of *The Mind and Society* accomplishes two things.

First, it prepares for the analysis represented by residues and derivations. Second, it makes general observations on the ways in which social science has gone wrong in the past and on the ways it must take to go right in the future : that is, it must follow the rules which have been found indispensable in the more advanced sciences. In this connection, a large number of the many theories in sociological works, past and present, which are not in accord with fact fall within the field of the derivations. There are two sorts of people, on the whole, who produce and accept such sociological theories. First, people who justify their own sentiments and non-logical actions by means of these non-logical theories. Second, people who, although their own sentiments are not directly involved, translate in sociological theories the observed non-logical actions of men into logical actions. The first sort of people are producing derivations in the strict sense ; the second sort of people are thinking in a way that is closely akin to producing derivations.

An example of the first kind of sociologists are the socialist theorists. (The so-called Fascist intellectuals would do just as well.) In the socialist theories, the constant element is obvious, a dissatisfaction with one political and economic régime or another and an effort to overthrow it. The constant element is justified in terms of a large amount of theoretical material, some logical, some non-logical. The non-logical part has shown a tendency to vary. In particular, historical interpretations have changed as time has failed to bear out some of MARX' predictions.

A characteristic of such theories is that they are arrived at by a way of reasoning which PARETO calls reasoning by accord of sentiments. For example, a certain person does not like wars. He also does not like something he calls capitalism. The inference is obvious to him : capitalism is the cause of wars—a non-logical theory. Reasoning by accord of sentiments was common in the Middle Ages in such sciences as physics and astronomy. Of course, if a theory which arises by accord of sentiments is used as scientists use such a theory—as an hypothesis to be accepted or rejected according as it is confirmed by the facts or not confirmed—then no harm is done. But people are likely to elevate such theories into absolutes. On the whole, the maturer sciences have progressed by abandoning this kind of reasoning and confining themselves to observation of fact and strictly logical inference therefrom. Sociology, PARETO thinks, is in a position now like that of the physical sciences in medieval times. Only by following a similar path can it make progress.

The second kind of sociologists, those who translate non-logical actions into logical ones, fall in turn into two groups. There are those who

take at their face value the derivations other men have used to make their non-logical actions seem logical. Thus the friction between North and South which led to the American Civil War has been described as if it really was, what some people said it was at the time, a constitutional debate over "States' Rights." There are others who, even when the men they observe have used no derivations to explain their non-logical actions, find without any trouble their own logical explanations for these actions. Such are the anthropologists, particularly those of a former generation, who, in accounting for the anthropomorphism of primitive peoples, have given the primitives credit for a logical subtlety they do not possess. All such students of society, even if they have half perceived the non-logical character of many of the actions of men, at once describe them as if they were logical, as if men simply carried out conclusions logically drawn from abstract principles. Since they are themselves trained in logical thinking, such sociologists have unconsciously assumed that men in general act logically. They have made over mankind in their own image.

In summary of the first part of PARETO's book, the following may be said. A considerable number of the actions of men are non-logical. Men, however, want to make these actions seem logical. They invent principles and persuade themselves that these actions are their logical consequences. Many students of society, also, are so persuaded, and study these principles as a primary factor in determining the form of human societies. A study of the facts, however, shows that these principles vary greatly, whereas the ways men act remain relatively constant, and the experience of the mature sciences teaches that in order to set up statements of uniformities (scientific laws) people must first consider the constant elements in phenomena. The method, then, of the above-mentioned students of society is inexpedient.

After so much in general about PARETO's way of attacking the problems of sociology, it is not necessary to go into detail about the work of the main portion of his book. He classifies the residues—which correspond to uniformities observed in the non-logical actions of men—into six classes. The first class he calls Combinations. They include : (a) manifestations of the instinct to invent, to try something new, and (b) the *motives* of some of these combinations, such as the combination of fancied likes with likes in sympathetic magic. The second class PARETO calls Persistent Aggregates (translated Group Persistences in the present English version.) They include manifestations of the feelings which are summed up in the word *home* in contrast to the word *house* in the expression *house and home*. Also devotion to one's country, to one's ancestors, to one's social class, to an abstraction or personification

such as liberty. These residues furnish that element of stability and routine without which any society would go to pieces. These first two classes of residues are the two in terms of which PARETO chiefly works later in his book. The other classes of residues include such things as manifestations of sentiments in actions, such as crying or cheering, uniformities of dress and behavior, pity, asceticism, self-sacrifice, feelings of inferiority or superiority in the social hierarchy, maintenance of the integrity of the individual, such as his honor, and sexual residues. This is a loose and not exhaustive classification, and PARETO, who set it up with one end in view, did not make a distinction, which is important from another point of view, between two main kinds of residues in his list. There are the residues which are manifestations of impulses which are part of the animal, as opposed to the specifically human, inheritance of men. Thus dogs, as well as men, manifest their sentiments in actions, by wagging their tails. There are also the residues, the ways of behaving, which are imposed on an individual through his membership in a specific, organized, human society.

The derivations—the things men say to explain their non-logical actions—PARETO divides into four classes, which he calls Affirmations, Authority, Accord of Sentiments, Verbal Proofs.

To reach a first approximate description of the workings of society, PARETO says he will consider the interaction of four variables: the residues, the derivations, the interests, and the circulation of the élite. These last two factors appear late in *The Mind and Society*. The *interests* is PARETO's name for those of the logical actions of men which other people would call the economic interests of men, or other interests like them. The *circulation of the élite* takes into consideration the heterogeneity of society and the rise of men from the subject class into the governing class.

These four variables are in a state of mutual dependence. Each of them acts on the others and is acted upon by the others. PARETO says that there are two main ways of describing the successive states taken by a system of this sort, a system of mutually dependent variables. One is to consider changes in one of the variables as the cause of the changes in the other variables. Many students of society have reasoned in this way, for example, the adepts of the economic interpretation of history. But this does not give a significant result, because no account is taken of the mutual dependence of the variables. The other way is to take account of this mutual dependence. This in turn falls into two forms. The first and most satisfactory is to set up mathematically a series of simultaneous equations. Unfortunately this method has still little application in sociology, for we lack satisfactory measures of many

of the most important variables, and therefore we are unable to use mathematics. The alternative is to take account of the state of mutual dependence by considering systematically the action of each variable in turn on the others and then considering the reaction of these variables on the first. This is the method PARETO uses in treating of the mutual dependence of residues, derivations, interests, and the circulation of the élite. It loses some of its disadvantage as a method when one variable is relatively a more important variable than some of the others. In this case, as has been shown, the residues are a more important variable than the derivations.

The four factors which PARETO considers show two kinds of mutual dependence. One is the direct kind of mutual dependence which has just been described. The other is the indirect mutual dependence to which these factors are subject as all being elements of a system, the social system. One of the characteristics of this second kind of mutual dependence is that of the equilibrium of such systems. That is, if there is a change in any one of the elements of the system, all the elements will react in such a way as to tend to restore the system to its original state.

With these logical tools and these abstractions from observed fact, PARETO makes a deductive interpretation of several parts of history. The facts will show many of his conclusions to be wrong, but there is no doubt of the soundness of his method of approach.

Of the factors that went to make *The Mind and Society* what it is, PARETO's experience in applied mathematics is one of the most important. His thesis upon graduation from the Polytechnic Institute in Turin concerned the mathematical theory of equilibrium in elastic solids, and he worked at mathematics all his life. Mathematics has found a steadily widening field of application in the sciences. From physics and astronomy, it has spread into thermo-dynamics, chemistry, and so on. ANTOINE-AUGUSTIN COURNOT, first seriously attempted to use mathematics in economics. LÉON WALRAS, PARETO's predecessor at Lausanne, developed the mathematical theory of equilibrium in that field. Elaborated and extended by PARETO, this body of work in its main features stands today.

Mathematics is the only method so far devised satisfactory for the logical analysis of states of complicated mutual dependence among variables. A man who is experienced in the mathematical analysis of states of this sort, will, even in the cases in which he is unable to apply mathematics, be aware of certain things which are beyond a man who has not had this kind of experience. Among states of complicated mutual dependence among variables are social systems. Unfortunately mathematics cannot be widely applied in the analysis of social systems. But PARETO, although

he was unable to use his mastery of mathematics in their study, was by previous experience in the mathematical analysis of other such systems, in mathematics and economics, aware that the mutual dependence had somehow to be taken into consideration and of the difficulties in doing so. These things are likely to escape sociologists without training in mathematics.

In the absence of mathematics, PARETO took account of the mutual dependence of the variables in the social system by considering first the action of one of the variables on the others, then their reaction on the first, and so on systematically, as described above. This is a clumsy method, and as a result some people have called *The Mind and Society* over-elaborate and pretentious. If they had had the kind of experience PARETO had, they would perhaps have understood that he adopted the method only for lack of a better one. Experience only, not intelligence, can teach them this.

Besides his experience in applied mathematics, three main elements in PARETO's acquirements are prominent in *The Mind and Society*. First, he was widely acquainted with the history of and the work being done in the natural sciences. He was familiar with applied physics and celestial mechanics—witness his discussion of the methods of approaching the investigation of the tides (§ 1731)—and to a lesser extent with chemistry and biology. A second element was his knowledge of Greek and Latin literature, from which he drew very largely the illustrative material of *The Mind and Society*. A classical scholar of standing has testified that in this field PARETO avoided almost all mistakes of the first order. Finally, PARETO knew in detail the history of parliamentary democracy in France and Italy. This probably stems from the time when PARETO himself in his earlier years was fighting the protectionist policy of the Italian government.

In sociology, ARISTOTLE and of course MACHIAVELLI were his predecessors in the study of what men do, not what they ought to do. He was also much influenced by PIERRE BAYLE, author of the *Dictionnaire historique et critique*. Another sociologist who affected him greatly as a young man was COMTE, but he seems to have outgrown this influence in the main, if we can judge by his analysis of COMTE's theories in *The Mind and Society*. Among his contemporaries he was closest to GEORGES SOREL, and each of the two men seems to have influenced the other's thinking. He had read, too, many of the other important sociological and anthropological works of his time.

PARETO's analysis of past history led him to expect that some régime which used much force in governing would overthrow the government by ruse of decadent parliamentary democracy. This prediction was

of course verified in MUSSOLINI'S March on Rome, and the Fascists have rationalized what they have done in terms of PARETO'S theories. But there is nothing to show that PARETO took sides himself. His personal preference was for liberty and the federal government of Switzerland, and his theories can be used to explain what has happened in Germany and in Russia as well as in Italy. All these considerations, however, have naturally not prevented some people from calling PARETO "the Marx of Fascism."

The present translation into English of PARETO'S *Trattato di Sociologia generale* by ANDREW BONGIORNO and ARTHUR LIVINGSTON is what may be called a literary translation. It is not always a literal translation even when to be literal would involve no clumsiness of expression in English. For instance, in § 218, a literal translation of one of PARETO'S sentences would run: "It is precisely the constant elements in phenomena that science seeks in order to reach the knowledge of uniformities." This is translated by BONGIORNO and LIVINGSTON: "Now science looks for constant elements in phenomena in order to get at uniformities." Though more lively in tone than a literal translation, this translation hardly is a gain in clarity, particularly the expression "to get at uniformities." Again, in § 126 the present translators render the Italian word *vincolo*, referring to a particular kind of condition in mechanics, as *ties*, although there is already a good English expression used in treatises on mechanics to refer to just this kind of condition, the expression *connections and constraints*. Furthermore, some of PARETO'S own technical expressions have been changed by these translators. For instance, a literal translation of PARETO'S name for residues of the second class would be *Persistence of Aggregates*. This has been rendered in the present version *Group Persistences*, again hardly a gain, especially at a time when the word *group* is being used by sociologists on every conceivable occasion. But as PARETO himself says, one must never dispute over words. As long as the translators use the words they have chosen unambiguously and consistently, there can be no quarrel with them. This BONGIORNO and LIVINGSTON have done; indeed LIVINGSTON has been very honest in pointing out in footnotes all serious departures from a strict rendering of PARETO'S Italian text. The point of view which determined the character of this translation is described in LIVINGSTON'S "Editor's Note," where he explains why he called the translation *The Mind and Society* instead of *Treatise of General Sociology*. "It is my faith," he writes, "which I assert as a faith, and perhaps *quia absurdum*, that the general public is interested, and has an interest, in objective thinking apart from sentiment—." This is a curious position to take in the face of PARETO'S own remarks in § 86 on the probable

popularity of his book :—" My sole interest is the quest for social uniformities, social laws. I am here reporting on the results of my quest, since I hold that in view of the restricted number of readers such a study can have and in view of the scientific training that may be taken for granted in them, such a report can do no harm. I should refrain from doing so if I could reasonably imagine that these volumes were to be at all generally read." We must be endlessly grateful to BONGIORNO and LIVINGSTON for translating the *Trattato* into English and for supplying it with a thorough index, a feature which the book has lacked up to now. We must be grateful for the reverence with which they have treated PARETO's work. But, in short, theirs is a literary translation of a book which in the original is not literary in tone or purpose, a book written by one scientist for other scientists. Perhaps a translation of this sort is a legitimate concession to the publisher who was willing to take the risk of printing such a book but wanted some prospect of selling a few copies to the general public. It must be pointed out, however, that the French translation of the *Trattato*, which was *revue* by PARETO himself, has not these defects of *The Mind and Society*.

Harvard University.

GEORGE C. HOMANS.

Forty-fourth Critical Bibliography

of the
History and Philosophy of Science and of the History
of Civilization

(to end of May 1935,—with special reference to India)

This forty-fourth Bibliography contains about 410 items of which 67 deal with India. They have been kindly contributed by the ten following scholars belonging to 4 different countries :

C. W. ADAMS (Hertford, England)	A. POGO (Washington)
R. C. ARCHIBALD (Providence, R.I.)	SHIO SAKANISHI (Washington)
C. A. KOFOID (Berkeley, Calif.)	G. SARTON (Cambridge, Mass.)
RALPH E. OCKENDEN (London)	KURT VOGEL (Munich)
J. PELSENEER (Brussels)	MARY E. WEEKS (Lawrence, Kans.)

This Bibliography includes as usual a series of addenda and errata to SARTON's *Introduction to the History of Science*, vols. 1 and 2 (Baltimore and London, 1927 and 1931). Its purpose and methods have been explained in the preface to the thirty-eighth Critical Bibliography (*Isis* 20, 506-08).

The section on India is especially full, as I have liquidated as much as I could of my stock of notes concerning it.

I have in my drawers a large number of notes which I shall be glad to publish as soon as I have been able to check them upon the originals.

I entreat the authors of relevant books and papers to send me copies of them *as promptly as possible* in order that their studies may be registered in this bibliography and eventually reviewed and discussed. By so doing they will not simply help me and every other historian of science but they will help themselves in the best manner for they will obtain for their work the most valuable publicity and its certain incorporation into the literature of the subject.

Many of the notes were checked and the final manuscript and proofs of this Critical Bibliography were kindly read by Dr. M. C. WELBORN.

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GEORGE SARTON.
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PART I

FUNDAMENTAL CLASSIFICATION (CENTURIAL)

VIIIth Century B.C.

Hartner, Willy. Das Datum der Shih-Ching-Finsternis. *T'oung Pao* 31, 188-236, 1934. ISIS

"Die Sonnenfinsternis von — 775 IX 6 (jul. Stil), die in China seit dem Ende der Hanzeit, in Europa seit rund 200 Jahren (Gaubil) als 'Shih-ching-Finsternis' betrachtet wird, kann nicht mit dieser identisch sein, da sie im Gebiet des alten China (Unterlauf des Gelben Flusses) nicht sichtbar gewesen ist. Die Sonnenfinsternis von — 734 XI 30 ist in der Zeit zwischen dem Beginn der Choudynastie (1122 v. Chr.) und dem Ende der Ch'un-ch'iu-Periode (470 v. Chr.) die einzige, die mit den Angaben der Shih-ching-Ode (*Chinese Classics* IV, 320) übereinstimmt."

Pfeiffer, Robert H. State letters of Assyria. A transliteration and translation of 355 official Assyrian letters dating from the Sargonid period (722-625 B.C.). XIII+265 p. (*American Oriental series*, 6). New Haven, American Oriental Society, 1935. (\$4.50). ISIS

These letters (except one) were selected from those published in cuneiform by R. F. HARPER (Chicago 1892-1914). The present translations are independent of those made by L. WATERMAN (3 vols. Ann. Arbor 1930-1). Some of the letters may interest our readers: "Public works: building materials, carpenters, construction work, foundation inscriptions, digging of canals. III. Agriculture and commerce. Transportation: delivery of horses, and of miscellaneous items. Ships, and transportation by water. Husbandry: shepherds. Agricultural produce. Metal work and sculpture. Weaving. VI. Magic and medicine. The collection of texts on magic and divination. Magical ceremonies, incantations, expiatory rites. Medicine. VII. Astronomy, astrology, and divination. Astronomical observations. Interpretation of astronomical omens. Interpretation of meteorological omens. Animal omens and their interpretation. Determination of auspicious days." The scientific contents are meager but such as they are the historian of science dealing with that period should take them into account. G. S.

VIIth Century B.C.

Fox, W. Sherwood; Pemberton, R. E. K. Passages in Greek and Latin literature relating to ZOROASTER and Zoroastrianism translated into English. *Journal Cama Oriental Institute* no. 14, 147 p., 1929. ISIS

- Modi, Jivanji Jamshedji** (1854-1933). The birth-place of ZOROASTER. *Journal Cama Oriental Institute*, no. 9, 1-113, 1927. ISIS

Vth Century B.C.

- Rey, Abel.** Les mathématiques en Grèce au milieu du V^e siècle. 92 p., 8 fig. (*Exposés d'histoire et philosophie des sciences*, 1). Paris, HERMANN, 1935 (18 fr.). ISIS

Esquisse de la pensée mathématique au v^e siècle B. C. — un âge d'or qu'on ne peut qu'admirer davantage à mesure qu'on le connaît mieux. L'avant propos est une défense habile de l'histoire des sciences. Ceci est suivi de la traduction in extenso du prologue du commentaire de PROCLUS aux *Eléments* d'EUCLIDE : le seul texte ancien un peu étendu relatif à l'histoire des mathématiques jusqu'à EUCLIDE. Ensuite : 1. Considérations générales; 2. Le théorème dit de PYTHAGORE; 3. La portée technique des spéculations mathématiques jusqu'au milieu du v^e siècle; 4. Arithmétique et système métrique, algèbre, géométrie et algèbre géométrique; 5. Le bilan des connaissances mathématiques des Grecs au milieu du v^e siècle et les nouveaux problèmes; 6. HIPPOCRATE de Chio; la quadrature des lunules; 7. Les premiers éléments. La duplication du cube. L'Apogée. Un appendice discute la découverte de NEUGEBAUER relative aux équations cubiques babyloniennes.

G. S.

IIIrd Century B.C. (whole and first half)

- Jörg, Edgar.** Des BOETIUS und des ALFREDUS MAGNUS Kommentar zu den "Elementen" des EUKLID (nach dem Codex Z. L. CCCXXXII B. der Biblioteca Nazionale di S. Marco zu Venedig). Zweites Buch. 34 p. (Heidelberg doctor's thesis). Bottrop i.W., POSTBERG, 1935. ISIS

Interesting contribution to the study of the mediaeval EUCLID tradition, a by-product of the author's investigations on REGIOMONTANUS. G. S.

- Souques, A.** Que doivent à HÉROPHILE et à ERASISTRATE l'anatomie et la physiologie du système nerveux? *Bull. de la société franç. d'hist. de la méd.* 28, 357-65, 1934. ISIS

Ist Century (whole and first half)

- Temkin, Owsei.** CELSUS' "On medicine" and the ancient medical sects. *Bull. of the Institute of the History of Medicine* 3, 249-64, 1935. ISIS

Ist Century (second half)

Maspero, Henri. Les origines de la communauté bouddhiste de Lo-Yang. *Journal asiatique* 225, 87-107, 1934 (received March 1935).

ISIS

"En résumé tout ce que nous connaissons du Bouddhisme en Chine au 1^{er} siècle de notre ère nous ramène à YING, roi de Tch'ou, et à son entourage. C'est autour de ce premier protecteur que s'organisa la plus ancienne communauté bouddhique connue, celle de P'eng-tch'eng. C'est dans ce milieu que se développa (s'il ne s'y forma pas) le taoïsme bouddhisant qui devait ouvrir la voie au Bouddhisme en lui permettant de se répandre subrepticement dans les communautés taoïstes, de sorte que celles-ci jouèrent à son égard dans une certaine mesure un rôle analogue à celui que les communautés juives du monde romain jouèrent à l'égard du christianisme naissant."

Sage, Evan T. Medicine in the romance of PETRONIUS. *Annals of medical history* 7, 192-96, 1935.

ISIS

IInd Century (whole and first half)

Gordon, Hirsch Loeb. L'emofilia. Il morbo di SIMEONE BEN GAMALIELE II (secondo secolo). *Policlinico*, 19 p. Roma, Il Policlinico, 1934.

ISIS

According to the *Tosefta*, Rabbi SIMEON BEN GAMALIEL II, tanna of the third generation, president of the Great Sanhedrin, who flourished in Palestine in the first half of the second century, was already aware of the existence of hemophilia, — and in cases where circumcision had caused the death of three brothers, he stated that it was better not to circumcise a fourth one. Elaborate discussion of this and of our knowledge of hemophilia in general.

G. S.

(Ptolemy, Claudius). Geography of CLAUDIUS PTOLEMY, translated into English and edited by EDWARD LUTHER STEVENSON; based upon Greek and Latin manuscripts and important late fifteenth and early sixteenth century printed editions, including reproductions of the maps from the Ebner Manuscript, ca. 1460, with an introduction by JOSEPH FISCHER (S. J.). XVI+167 p., 116 p. of reproductions. New York, Public Library, 1932.

ISIS

Reviewed by AUBREY DILLER, *Isis* 22, 533-39, 1935.

IVth Century (whole and first half)

Horapollon of Nicopolis (*Intr.* 1, 358). See J. MASPERO in *Bulletin de l'Institut français d'archéologie orientale* (vol. XI, 1914). HENRI SOTTAS: *Lettre de Champollion à Dacier* (Paris 1922, p. 26-8, 76, passim).

G. S. ISIS

VIIth Century (whole and first half)

Rasslan, Wassel. MO.IAMMED und die Medizin nach den Ueberlieferungen. 51 p. (*Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften*, H. 1). Berlin, EBERING, 1934. ISIS

VIIth Century (second half)

Ananias, Armenian astronomer and mathematician (Note to be added to *Introduction*, I). Gestorben c. 670. Schrieb: 1) Eine Selbstbiographie, in der er seine Reisen zur Erlernung der Mathematik schildert. Sein Lehrer: Τύχικος in Trapezunt. 2) "Über die Masse und Gewichte." 3) Eine Aufgabensammlung mit 24 Aufgaben mit wertvollem geographischem und historischem Inhalt: "Frage und Auflösung"; Problemstellung und Lösung, aber ohne Lösungsmethode. Die Aufgaben stehen auf der Höhe der griechischen arithmetischen Epigramme oder der Aufgaben bei NICOLAS RHABDAS. 4) Aufgaben (6), die beim Schmausen geboten werden." 5) Eine kurze Anleitung zu den Rechenoperationen. ISIS

Text und Übersetzung — Gesamtausgabe von PATKANIAN (Petersburg 1877) ohne 3-5. Zu 1) Übers. von F. C. CONYBEARE in *Byzant. Zeitschr.* 7, 1897, 572-584. Zu 2) Ausg. PATKANIAN S. 27-31, 3. Zu 3) Ausg. von Aufg. 1-6 in *Bazmavep*, Venedig 1853, 48, 144, 335; 1854, 160, 256; 1855, 304; Aufg. 1-24 in *Sion*, Jerusalem 1866, 78, 94, 108 f., 157 f., 174 f.; kritische Ausgabe von G. TER-MKRTTSCHEAN in *Ararat* 1896, 143-156, 199-208. Deutsche Übers. von P. SAHAK KOKIAN in *Zeitschr. für die österr. Gymnas.* 69, 1919/20, 112-117. 4) und 5) ist unediert.

Kritik. C. FRIEDRICH NEUMANN, Versuch einer Geschichte der armenischen Literatur, Leipzig 1836, 100-01. Zu 2) PASCAL AUCHER: Erklärung der Masse und Gewichte der Alten, Venedig 1821, S. 207; V. VAZQUES QUEIPO: Essai sur les systèmes métriques et monétaires des anciens peuples I, Paris 1859, S. 196-200. Zu 3) L. ALISCHAN in *Schirak*, Venedig 1881, S. 2 ff. in *Ararat*, Venedig 1890, S. 138; und in *Haiapatum*, Venedig 1901, S. 531-33; GR. CHALATHEANZ in *Das armenische Epos*, Moskau 1896, S. 223 ff; P. AKINIAN (der die Ausgabe von 4 und 5 vorbereitet) in *Handes Amsorya* 27, 1913, S. 78.

KURT VOGEL.

VIIIth Century (second half)

Māshāllāh (*Intr.* 1, 531). The tract *De compositione et utilitate astrolabii* is not inserted in the 1503 ed. of *Margarita Philosophica*. It appears to have been first appended to the edition of 1515, and was reproduced (I think) in every subsequent edition. The title in 1515 was *Astrolabij Messahalath compositio*. RALPH E. OCKENDEN. ISIS

IXth Century (whole and first half)

- Van de Vyver, A.** DICUIL et MICON de Saint-Riquier. *Revue belge de philologie et d'histoire* 14, 47 p., 1935. ISIS

"La grammaire et le comput étaient les sciences en faveur lors de la Renaissance carolingienne. Dans ses capitulaires, CHARLEMAGNE obligea le clergé à connaître le comput ecclésiastique aussi bien que l'Écriture, les prières et le chant. De nombreuses œuvres et compilations de comput virent le jour à la suite de l'assemblée de computistes qui se réunit en 809 sur l'ordre de l'empereur et arrêta les principales données, souvent controversées, servant à établir la date de Pâques. Je me propose de décrire ces ensembles de textes, la plupart du temps très décousus et anonymes, — ils font le désespoir des auteurs de catalogues de manuscrits, — et de classer leurs copies, qui présentent en marge des cycles pascals les plus anciennes chroniques médiévales, dans un de mes ouvrages qui établiront l'évolution scientifique du haut moyen âge en se basant avant tout sur l'étude comparée des recueils ou *corpus* de traités en usage pour chaque matière, aux différentes époques, dans de nombreux centres. A présent, je voudrais préciser l'œuvre, très variée, de l'un des rares computistes qui nous ait confié son nom, l'irlandais DICUIL. On connaît depuis longtemps son *De mensura orbis terrae*, la première compilation médiévale de géographie, rédigée en 825."

IXth Century (second half)

- Giles, Lionel.** A topographical fragment from Tunhuang. *Bulletin of the School of Oriental Studies* 7, 545-72, 2 pl., 1934. ISIS

- Rand, Edward K.** The supposed Commentary of JOHN THE SCOT on the "Opuscula sacra" of BOETHIUS. *Rev. néoscol. de phil.* 36, 67-77, 1934. ISIS

- Sadi, L. M.** The millennium of AR-RAZI (RHAZES) (850-932 A.D.?). *Annals of medical history* 7, 62-72, 1935. ISIS

Xth Century (whole and first half)

- Madkour, Ibrahim.** La place d'AL-FĀRĀBĪ dans l'école philosophique musulmane. Préface de LOUIS MASSIGNON. VIII+254 p. Paris, Librairie d'Amérique et d'Orient, 1934. ISIS

Elaborate study based upon the Arabic sources. G. S.

- Ruska, Julius.** Der Urtext der Tabula chemica. *Archeion* 16, 273-83, 1934. ISIS

Apropos of MUHAMMAD IBN UMAIL.

Xth Century (second half)

Ḥamzah al-Iṣfahāni. The annals of ḤAMZAH AL-IṢFAHĀNI. Translated from Arabic by U. M. DAUDPOTA. *Journal Cama Oriental Institute*, no. 22, 58-120, 1932. ISIS

Muḥammad Khan Qazvīnī. ABŪ SULAIMĀN MANTIQĪ SIDJISTĀNĪ, savant du IV^e siècle de l'Hégire. 50 p. in Persian, 2 in French. (*Publications de la Société des études iraniennes et de l'art persan*, 5). Chalon-sur-Saône, BERTRAND, 1933. ISIS

Persian study on two Arabic treatises composed by two Persians: the first *Šivān al-ḥikma* composed by ABŪ SULAIMĀN MUḤAMMAD B. ṬĀHIR B. BAHRĀM AL-SIJISTĀNĪ, called AL-MANTIQĪ (fl. c. 980), the second, a continuation (*tatimma*) of the first by ABŪ-L-ḤASAN 'ALĪ B. ABI-L-QĀSIM ZAID AL-BAIHAQĪ (c. 1106-1174). See my *Introduction* (2, 445). According to the French summary: "Le premier de ces ouvrages, connu seulement par des abrégés encore inédits, fournit un exposé des principes de la philosophie, fondé sur les opinions des docteurs antérieurs à l'Islam. Son auteur, dont la biographie forme l'essentiel de ce travail, naquit vers le commencement du X^e siècle. Ce grand docteur fut à Bagdad l'élève de deux philosophes chrétiens de langue arabe et jouit de la protection des princes Bouïdes. Dans sa demeure se réunissaient les savants du temps; leurs débats furent transmis à la postérité par ABŪ ḤAYYĀN TAWḤĪDĪ, dans un livre fort important pour l'histoire des idées. Plusieurs auteurs arabes ont parlé d'ABŪ SULAIMĀN AL-MANTIQĪ; il a composé une dizaine d'ouvrages.

"Le second ouvrage, la *Tatimma* de BAIHAQĪ, forme la suite du précédent. On y trouve en effet les biographies des savants originaires des régions orientales du monde musulman (Khorassan, Transoxiane, etc.) et particulièrement celles des contemporains de l'auteur qui s'est attaché surtout à rapporter leurs paroles mémorables. Fréquemment, la *Tatimma* se trouve mieux informée que les autres recueils biographiques composés par des Irakiens, des Syriens ou des Egyptiens: ainsi pour les biographies de KHAYYĀM et de quelques-uns de ses disciples, pour celles d'AVICENNE et de BIRŪNĪ."

G. S.

al-Qabīṣī (*Intr.* 1, 669; 2, 170). ORONCE FINE's translation entitled *Traité d'Alcabice touchant les conjunctions des planètes en chacun des 12 signes* was published at Paris in 1551, 1556, 1557. This was appended to the later editions of FINE: *Les canons et documens tresamples* first published at Paris in 1543. Copies of the editions of 1551 and 1557 are in the Bibl. Nat. The title of the ed. of 1556, which I have inspected in the B.M., runs: "Les canons & documens tresamples, touchant l'usaige & pratique des communs Almanachz, que l'on nomme Ephemerides... Avec un traicté d'Alcabice nouvellement adiousté, touchant les conionctions des Planètes en chascun

des 12 signes & de leurs prognostications & (sic, presumably printer's misreading of es) revolutions des années." RALPH E. OCKENDEN.

ISIS

XIth Century (whole and first half)

Birkenmajer, Alexander. AVICENNAS Vorrede zum "Liber sufficientiae" und ROGER BACON. *Rev. néoscol. de phil.* 36, 308-20, 1934.

ISIS

Goichon, Mlle. A. M. Introduction à AVICENNE. Son épître des définitions, traduction avec notes. Préface de MIGUEL ASÍN PALACIOS. XXXVII + 217 p. Paris, DESCLÉE, DE BROUWER, 1933.

ISIS

French annotated translation of IBN SINA's *Manṭiq al-mashriqīyīn* (Cairo 1328).

G.S.

Nöldeke, Theodor. The Iranian national epic. *Journal Cama Oriental Institute*, no. 6, 161 p., 1925.

ISIS

XIth Century (second half)

Asín Palacios, Miguel. La espiritualidad de ALGAZEL y su sentido cristiano. Tomo II, 565 p. (Publicaciones de las Escuelas de Estudios árabes de Madrid y Granada, serie A, núm. 2). Madrid, ESTANISLAO MAESTRE, 1935. (25 pesetas).

ISIS

The first volume of this monumental work was reviewed in *Isis* 23, 494. Its purpose is to make available to western scholars the great theological encyclopaedia of al-GHAZZĀLI, the *Kitāb ihyā 'ulūm al-dīn*. It will suffice to indicate the contents of this second volume which do not concern our readers directly.

La vía unitiva. 16. Introducción general; 17. De la penitencia; 18. De la paciencia; 19. De la gratitud a los beneficios divinos; 20. De la esperanza y el temor; 21. De la pobreza voluntaria; 22. Del ascetismo o renunciación al mundo; 23. Del abandono o dejamiento en manos de Dios; 24. Del amor de Dios.

This book will be very precious also to Arabic scholars, for al-GHAZZĀLI's work is not easy to read. We hope that Don MIGUEL's interpretation will eventually be completed by elaborate indices. This splendid publication does credit not only to the author, but also to the Spanish Arabic schools, and to the Spanish government. It is rather amusing to think that that government would probably refuse to subsidize a Catholic publication, but makes possible the publication of an Islamic one dealing essentially with the same questions.

G. S.

XIIth Century (whole and first half)

Forest, Aimé. Le réalisme de GILBERT DE LA PORRÉE dans le commentaire du "De Hebdomadibus." *Rev. néo-scol. de phil.* 36, 101-10, 1934. ISIS

Naficy, Abbas. La médecine en Perse des origines à nos jours. Ses fondements théoriques d'après l'Encyclopédie médicale de GORGANI. 142 p., figs. Paris, Les Editions Vega, 1933. ISIS

After a short summary of the history of medicine in Persia down to our own day (52 p.) the author discusses the generalities and the medical philosophy explained in the medical encyclopaedia of ISMĀ'IL AL-JURJĀNI (*Introd.* 2, 234). This is followed by a short French-Persian glossary of technical terms and a poor bibliography. There is no study of sources, and no index. It would be interesting to compare JURJĀNI's definitions and principles with those of other physicians of the Islamic world, e.g., 'URĀIDALLĀH IBN JIBRĀ'IL IBN BAKHTĪSHŪ', about whom see MAX MEYERHOF in *Isis* 10, 340-49, 1928. G. S.

Sassen, Ferdinand. L'enseignement scolastique à l'abbaye de Rolduc au XII^e siècle. *Rev. néoscol. de phil.* 36, 78-100, 1934. ISIS

Scalinci, Noè. Il "Libro pro sanitate oculorum" di MO. DAVIDE ARMENIO, oculista salernitano del secolo XII. Noto come "Tractatus de oculis Canamosali." Naples, IDELSON, 1934. ISIS

Reviewed in *Annals of medical history* 7, 95, 1935; by D. G., *Rivista di storia delle scienze mediche* 25, 271, 1934.

XIIth Century (second half)

Castiglioni, Arturo. MOSÈ MAIMONIDE, medico e filosofo nell'ottavo centenario della sua nascita (1135-1935). *Rassegna clinico scientifica dell'Istituto Biochimico Italiano*, N. 4, 13, 23 p., Milan, 1935. ISIS

Cohen, Boaz. The classification of the law in the Mishneh Torah. *Jewish Quarterly Review* 25, 519-40, 1935. ISIS

Creutz, Rudolf. URSO, der letzte des Hochsalerno, Arzt, Philosoph, Theologe. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 5, 14 p., Berlin, EBERING, 1934. ISIS

Davidson, Israel. Mnemonic verses concerning the works of MAIMONIDES. *Jewish Quarterly Review* 25, 429-39, 1935. ISIS

Finkelstein, Louis. MAIMONIDES and the Tannaitic midrashim.
Jewish Quarterly Review 25, 469-517, 1935. ISIS

Marx, Alexander. Texts by and about MAIMONIDES. *Jewish Quarterly Review* 25, 371-428, 1935. ISIS

I. The unpublished translation of M.'s Letter to IBN TIBBON. II. A philosophical prayer ascribed to M. III. The date of the *Guide of the Perplexed*. IV. M.'s introductory poem to his Commentary to the *Mishna*. V. Poems about M. VI. The Epistle of SHESHET HA-NASI BEN ISAAC of Saragossa to Lunel against R. MEIR ABULAFIA's attack on M. about Resurrection (ca. 1200).

Meyerhof, Max. (Al-morchid fi' l-kohhl) ou Le guide d'oculistique. Ouvrage inédit de l'oculiste arabe-espagnol MOHAMMAD IBN QASSOÛM IBN ASLAM AL-GHĀFIQĪ (XII^e siècle). Traduction des parties ophthalmologiques d'après le manuscrit conservé à la bibliothèque de l'Escorial. 225 p. Barcelone, MASNOU, 1933. ISIS

Reviewed by GEORGE SARTON, *Isis* 22, 539-42, 1935.

Morais, Sabato. A letter by MAIMONIDES to the Jews of South Arabia entitled "the inspired hope." Translated from the Arabic by Rabbi NAHUM HA-MAARABI into Hebrew and from this rendered freely into English. *Jewish Quarterly Review* 25, 330-69, 1935. ISIS

Translation of the *Iggeret teman* (see *Intr.* 2, 370, 377, 564). G. S.

Smith, Helmer. Saddanīti : la Grammaire Palie d'Aggavamsa. I. Padamālā. II. Dhātumālā; III. Suttamālā. 928 p. Lund, GLEERUP, 1928-30. ISIS

Reviewed in *Bulletin of the School of Oriental Studies* 7, 391, 1934.

Wolfson, Harry Austryn. MAIMONIDES on the internal senses. *Jewish Quarterly Review* 25, 441-67, 1935. ISIS

"MAIMONIDES' treatment of the internal senses conforms to the general method as it became standardized in the works of ALFARABI and AVICENNA. He continues to use the old medical threefold classification of the internal senses into imagination, cogitation, and memory. But by the side of this old medical classification he makes use also, though only indirectly, of the new philosophical classification, with its breaking up of imagination into several kinds of imagination and with its addition of common sense and estimation. The existence of these two classifications side by side is also to be found in the works of AVICENNA and AVERROES, for the newer classification did not altogether supplant the older one. Again like ALFABARI, and partly also like AVICENNA, he allows himself to use the term imagination rather loosely and to include under it not only common sense and the various forms of imagination but also the faculty of estimation."

XIIIth Century (whole and first half)

- Grabmann, Martin.** Eine für Examinazwecke abgefasste Quæstionensammlung der Pariser Artistenfakultät aus der ersten Hälfte des 13. Jahrhunderts. *Rev. néoscol. de phil.* 36, 211-29, 1934. ISIS
- Hartung, Edward F.** St. FRANCIS and medieval medicine. *Annals of medical history* 7, 85-91, 1935. ISIS
- Lottin, Odon.** L'identité de l'âme et de ses facultés pendant la première moitié du XIII^e siècle. *Rev. néoscol. de phil.* 36, 191-210, 1934. ISIS
- Masnovo, Amato.** Una polemica di GUGLIELMO D'AUVERGNE. *Rev. néoscol. de phil.* 36, 146-71, 1934. ISIS
- Phelan, Gerald B.** An unedited text of ROBERT GROSSETESTE on the subject-matter of theology. *Rev. néoscol. de phil.* 36, 172-79, 1934. ISIS

XIIIth Century (second half)

- Furlani, Giuseppe.** BARHEBREGO sull' anima razionale (Dal Libro del Candelabro del Santuario). *Orientalia* 1, 1-23, 97-115, 1932. ISIS
- Godard, André.** Les monuments de Marāgha. 22 p., 12 fig. (*Publications de la Société des études iraniennes et de l'art persan*, no. 9). Paris, LEROUX, 1934. ISIS
- This pamphlet will interest historians of science because of the chapter (p. 19-22, pl. VI-VII) devoted to the observatory established in Marāgha by NAŠIR AL-DĪN AL-ṬŪSĪ (see my *Introduction* 2, 1004). Nothing remains of that observatory but a few bricks, and underground grottoes which were probably a part of it. G. S.
- Hocedez, Edgard.** Une question inédite de PIERRE D'AUVERGNE sur l'individuation. *Rev. néoscol. de phil.* 36, 355-86, 1934. ISIS
- Hoffmans, Jean.** La table des divergences et innovations doctrinales de GODEFROID DE FONTAINES. *Rev. néoscol. de phil.* 36, 412-36, 1934. ISIS
- Longpré, Ephrem.** Etude sur les réportations de DUNS SCOT. Le MS 139 de la cathédrale de Valencia. *Rev. néoscol. de phil.* 36, 437-58, 1934. ISIS

Mager, Aloïs. Der νοῦς παθητικός bei ARISTOTELES und THOMAS VON AQUIN. *Rev. néoscol. de phil.* 36, 263-74, 1934. ISIS

Mandonnet, Pierre. ALBERT LE GRAND et la "Philosophia pauperum." *Rev. néoscol. de phil.* 36, 230-62, 1934. ISIS

"La *Philosophia pauperum* n'est autre chose que ce que ALBERT a appelé le *Compendium de naturali negotio*, c'est-à-dire un abrégé de ses cinq premiers grands traités sur les sciences naturelles. Le tout a été composé à Paris pendant les années 1240-1244. ALBERT a encore écrit dans le même laps de temps, mais après le *Compendium*, sa *Métaphysique* et le *Liber de Causis* qui lui sert de complément. Ces publications ont eu un retentissement extraordinaire et leur succès a éveillé chez ROGER BACON des sentiments d'irritation dont on trouve plus tard l'expression inconsidérée."

Peckham, John (*Intr.* 2, 1029). The figure of an eye appears in the ed. pr. of *Margarita Philosophica*, Freiburg, 1503. There is also a figure in the ed. pr. of *Perspectiva communis*, Milan, 1482. (I think it should be pointed out, however, that the figure in PECKHAM's tract is far less detailed than the elaborate figure given by REISCH).

RALPH E. OCKENDEN. ISIS

Polo, Marco (*Intr.* 2, 1059). The ed. pr. of GRYNÆUS' *Novus orbis*, giving a translation of MARCO POLO's *Travels*, was Basel, 1532. The Paris edition was published later in the same year. (The title page of the Basel ed. has: "Basileae apud Io. Hervagium, Mense Martio, Anno M.D.XXXII.") The colophon of the Paris ed. runs: "Impressum Parisiis apud Antigonum Augerellum, impensis Ioannis Parui & Galeoti à Prato. Anno M.D.XXXII. VIII. Calen, Novembris.") RALPH E. OCKENDEN. ISIS

Rodríguez, E. I. La universidad y la enseñanza en la época de San ALBERTO MAGNO. *Anales de la Universidad de Madrid* (Letras), 20, 42-61, 1934. ISIS

Well-documented article containing a biographical sketch of ALBERT THE GREAT and descriptions of the leading universities of his day, especially the University of Paris. M. E. W.

Ross, Sir E. Denison. Ta'rikh-i Jahān-gushāy of JUWAYNI. Vol. III, being a facsimile of a MS dated A. H. 690, with an introduction. 108 p. London, Royal Asiatic Society, 1931. ISIS

Reviewed by V. M., *Bulletin of the School of Oriental Studies* 7, 225, 1935.

Wallerand, Gaston. HENRI BATE de Malines et saint THOMAS D'AQUIN. *Rev. néoscol. de phil.* 36, 387-411, 1934. ISIS

XIVth Century (whole and first half)

Farmer, Henry George. A Maghribi work on musical instruments. *Journal of the Royal Asiatic Society* 339-53, 1935. ISIS

Apropos of the *Kitāb al-imtā' wal-intifā'* of MUHAMMED IBN IBRAHĪM. According to the author this is a later work than is stated in my *Introd.* (2, 633), being written only in 1301 and dedicated to ABŪ YA'QŪB IBN ABI YŪSUF IBN 'ABD AL-ḤAQQ, the Marinid sultan who ruled 1286-1307. He gives a better account of this work than CASIRI. G. S.

Kurdian, H. A note on the "Description of the Holy Land and of the way thither" by LUDOLPH VON SUCHEM (1350). *Journal of the American Oriental Society* 55, 102-04, 1935. ISIS

Papini, Giovanni. DANTE vivo. Translated from the Italian by ELEANOR HAMMOND BROADUS and ANNA BENEDETTI. London, DICKSON, 1934. ISIS

Pedrazzini, Cav. Uff. C. DANTE ALIGHIERI et la pharmacie al Canto delle Rondini à Florence. *Vorträge* 1934, 114-17, figs. *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

Ritter, Hellmut; Ruska, J.; Winderlich, R. Eine persische Beschreibung der Fayencetechnik von Kaschan aus dem Jahre 700 h./1301 d. *Istanbuler Mitteilungen* 3, 16-56, 1935. ISIS

Edition and German translation of a Persian text on the faience technique (the enamelling of earthenware) as practised in Kāshān (Jibāl, Persia). It is extracted from the *Jawāhir al-arā'is wa aṭāyib al-nafā'is* (a book on precious stones and perfumes) by ABŪ-L-QĀSIM 'ABDALLĀH B. 'ALĪ B. MUḤAMMĀD B. ABĪ ṬĀHIR. Edition based upon two Istanbul Mss of A.D. 1301 and 1583. The translation was made by JULIUS RUSKA and notes added by R. WINDERLICH. This text is important because it is the only one of its kind and was composed during the golden age of Persian faience. The absence of a glossary is shocking. G. S.

Ruska, Julius. L'alchimie à l'époque du DANTE. Traduit par A. KUENZI. *Annales Guébbard-Séverine* 10, 410-17, 1934. ISIS

Sarre, F. Eine keramische Werkstatt von Kaschan im 13.-14. Jahrhundert. *Istanbuler Mitteilungen* 3, 57-69, 1935. ISIS

Apropos of the Persian text edited by RITTER and RUSKA 1935, with an additional note by ARTHUR UPHAM POPE. G. S.

Schoor, Oscar van. La plus ancienne législation Medico-Pharmaceutique de Belgique. La keure d'Ypres (XIII^e-XIV^e siècles).

Vorträge 1934, 22-28, *Gesellschaft für Geschichte der Pharmazie*, 1934.

ISIS

"Ce livre des keures qui portait pour titre : *Ch'est li livres de toutes les heures de la ville d'Ypre*, contient des keures datant d'avant 1281, mais la majeure partie des documents y copiés concerne des règlements édictés entre 1292 et 1310. C'est vers cette dernière année que le livre fut rédigé."

Tanfani, Gustavo. JACOPO DONDI, medico Padovano del trecento, ed il suo metodo di estrazione del sale dalle acque termali. *Rivista di storia delle scienze mediche* 17, 8-23, 3 fig., 1935. ISIS

XIVth Century (second half)

Coville, Alfred. GONTIER et PIERRE COL et l'humanisme en France au temps de CHARLES VI. 234 p.+8 p. Paris, DROZ, 1934. ISIS

Reviewed by H. R. BRUSH, *Speculum* 10, 205-08, 1935.

De Roover, Raymond. Le livre de comptes de GUILLAUME RUYELLE, changeur à Bruges (1369). *Annales de la Société d'émulation de Bruges* 77, p. 15-95. 1934. ISIS

"Seules en Belgique, les archives communales de Bruges ont la bonne fortune de posséder une série de livres de marchands datant du Moyen Age. Parmi les registres commerciaux qui y sont conservés, il faut citer un grand livre de 1503 ayant appartenu à un drapier inconnu, un autre registre de 1507 et un mémorial de 1478 attribué à un membre de la famille DESPARS. Le fonds espagnol contient un journal de 1538 dont le titulaire était un certain JUAN DE CASTRO. Tous ces registres sont magnifiquement reliés en veau estampé." "Les archives brugeoises possèdent encore une série de livres de comptes, moins luxueusement reliés, il est vrai, mais d'autant plus précieux qu'ils datent du XIV^e siècle. Ils ont appartenu à deux changeurs brugeois, COLLARD DE MARKE et GUILLAUME RUYELLE. Ailleurs nous avons consacré une étude aux sept registres de COLLARD DE MARKE qui se suivent sans interruption de 1366 à 1369. Il reste à examiner un huitième registre de la même époque : le livre de comptes de GUILLAUME RUYELLE." (p.16). Ce RUYELLE n'était pas un ignorant, et sa comptabilité était bien tenue — mais il n'était pas au courant de la méthode italienne à partie double (p.28). Sur l'introduction de cette méthode aux Pays Bas, voir mon étude sur STEVIN (*Isis*, 21, 1934, p. 248, 264). G. S.

XVth Century (whole and first half)

Pedrazzini, Cav. Uff. C. Nobile Collegium Pharmaceuticum Romanum. *Vorträge* 1934, 107-13, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

"Conditum est Nobile Collegium Pharmaceuticum Romanum anno millesimo quadringentesimo vigesimo nono. Pontificis maximi MARTINI

quinti, humanitatis studiorum amatoris, litteris (diei octavi Martii mensis), quibus S. LAURENTII in Miranda Collegium sustulit, eiusque administrationem reditusque in perpetuum Universitati Aromatoriorum commisit."

XVth Century (second half)

Elsässer, Günter. Ausfall des Coitus als Krankheitsursache in der Medizin des Mittelalters. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 3, 40 p., Berlin, EBERING, 1934. ISIS

"Der Verhaltung der physiologischen Genitalsekrete wurde in der antiken Medizin eine grosse Bedeutung als Ursache mannigfacher Krankheiten beigemessen. Für die Antike war die Entleerung der Genitalsekrete ebenso ein Naturbedürfnis wie die Ausscheidung von Schweiss, Urin und Kot, und der Coitus galt zur Erhaltung der Gesundheit als ebenso notwendig wie Essen und Trinken. Welch hohe Bedeutung der Retention von Genitalflüssigkeiten auch im Mittelalter zugemessen wurde, dafür legt das hier edierte Manuskript des Theologen JOHANN VON WESEL ein überzeugendes Beispiel ab."

Includes the text of the tract *Ad quendam fratrem de Carthusia de purgacione renum* by JOHANN VON WESSEL (1419-1489) with German version.

Levy, Raphael. A note on French slang. *Jewish Forum*, March 1935.

ISIS

Apropos of the word *nazi* used in French slang for syphilis. It is derived from *lazi*, short for "mal de Saint LAZARE." Earliest printed record in C. VILLATTE: *Parisismen* (Berlin 1890) G. S.

Saxl, Fritz. Le fede astrologica di AGOSTINO CHIGI. Interpretazione dei dipinti di BALDASSARE PERUZZI nella sala di Galatea della Farnesina. 70 p., 34 fig. (*Reale Accademia d'Italia, collezione "La Farnesina,"* 1). Roma, 1934. ISIS

F. SAXL: Edifici "celesti" anteriori alla Farnesina; Interpretazione dei singoli quadri della volta; Che cosa predissero gli astrologi al Chigi?; L'antichità classica negli affreschi della Farnesina; L'astrologia e la cristianità nella fede del Rinascimento.

ARTURO BEER: Il significato astronomico e la data dei dipinti della volta della Sala di Galatea.

Ważyk, Wiktor. L'aristotélisme populaire comme fragment de la Renaissance. *Revue d'histoire de la philosophie et d'histoire générale de la civilisation* 9, 33-66, 1935. ISIS

XVITH Century (whole and first half)

B. — Physical sciences and technology

Pogo, Alexander. GEMMA FRISIUS, his method of determining diffe-

rences of longitude by transporting timepieces (1530), and his treatise on triangulation (1533). With 4 plates and a facsimile reproduction (no. XVI) of GEMMA's *Libellus de locorum describendorum ratione*, Antwerp, 1533. *Isis* 22, 469-506, 4 pl., 3 fig., 1935. ISIS

"Comments on and text of: 1. *De novo modo inveniendi longitudinem* (chapter XVIII of *De usu globi*, in GEMMA's *De principis astronomiae et cosmographiae*, Antwerp, 1530); 2. the first treatise on triangulation, GEMMA's *Libellus de locorum describendorum ratione* (annexed to APIAN's *Cosmographicus liber*, Antwerp, 1533)."

C. — Natural sciences

Stanton, Samuel McCoskry. The Admiral's map. What was it? And who the Admiral? *Isis* 22, 511-15, 1935. ISIS

Apropos of the *Charta marina* in the Strasbourg PTOLEMY of 1513. If the name "Admiral's map" is to be given to any early cartographical monument, it should be accorded to that *Charta marina*. "Also there would seem to be no room for doubt that the "former Admiral" (*quondam Almirantem*), to whose voyages the Strasbourg editors chiefly attribute the new discoveries recorded on that map, is COLUMBUS." G. S.

D. — Medical sciences

Elgood, Cyril. A treatise on the Bezoar stone by the late MAHMUD IBN MASUD the Imad-ul-Din the physician of ISPAHAN (c. 1520-1600?). Translated from the original Persian. *Annals of medical history* 7, 73-80, 1935. ISIS

Major, Ralph H. JOHANNES LANGE (1485-1565) of Heidelberg. *Annals of medical history* 7, 133-40, 4 fig., 1935. ISIS

E. — *Alia*

Kahle, P. Eine islamische Quelle über China um 1500. (Das *Khiṭāyname* des 'ALI EKBER). *Acta orientalia* 12, 91-110, 1934. ISIS

XVth Century (second half)

A. — Mathematics

Johnson, Francis R.; Larkey, Sanford V. ROBERT RECORDE'S mathematical teaching and the anti-Aristotelian movement. *Huntington Library Bulletin*, no. 7, 59-87, April 1935. ISIS

"The size and superiority of the school of practical mathematical scientists in England can be attributed to the movement initiated by ROBERT RECORDE, and the points in which the English excelled correspond to the most significant features of his system of teaching. These English scientists consistently avoided mere abstract theory on the one hand, and a narrow, unintelligent empiricism on the other. Instead, their constant goal was to combine a firm mastery of elementary principles with the practical application of those principles to useful works. Along with this, they cultivated a skeptical attitude towards ancient authorities, demanding that their statements be tested by reason and observation before acceptance. These qualities provided the solid foundation essential to future progress in the natural sciences, and RECORDE, for his important part in furthering this development deserves a prominent place in the history of science in England."

C. — *Natural sciences*

Cohen, Hk. CLUSIUS in Leyden. *Vorträge* 1934, 95-106, illus. *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

Zimmermann, Walther. Das Handherbarium des HIERONYMUS HARDER. *Vorträge* 1934, 232-43, 9 fig., *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

"HIERONYMUS HARDER ist eine ganz eigenartige Erscheinung in der Botanik und Pharmakobotanik des 16. Jahrhunderts. Wir dürfen ihn als einen berufsmässigen Verfertiger von Herbarien bezeichnen, der auf Bestellung an Fürsten und Bischöfe Pflanzensammlungen anlegte. Im Vorwort zum Herbarium, das heute im Naturhistorischen Hofmuseum in Wien liegt, sagt HARDER über seine Herbarien: "denn ich dann etliche jetzt in viertzig Jarn verricht und gemacht hat." Daraus kann errechnet werden, dass HARDER um 1554 mit der Anlage von Herbarien begann."

D. — *Medical sciences*

Baglioni, S. BARTOLOMEO EUSTACHIO e il suo insegnamento nell' Archiginnasio Romano. *Rivista di storia delle scienze mediche* 17, 1-7, 1 fig., 1935. ISIS

XVIIth Century (whole and first half)

B. — *Physical sciences and technology*

Winthrop, John (1606-76). The library and learning of JOHN WINTHROP, the Younger. 6 p. New York, *American Chemical Industries Tercentenary*, April 1935. ISIS

See *Isis* 11, 325-42, 1928.

D. — *Medical sciences*

Goulard, R. Convention relative à la maladie contagieuse régnante à Brie-Comte-Robert en 1622. *Bull. de la société franç. d'hist. de la méd.* 28, 366-67, 1934. ISIS

Pagel, Walter. Religious motives in the medical biology of the XVIIth century. *Bull. of the Institute of the History of Medicine* 3, 265-312, 4 fig., 1935. ISIS

E. — *Alia*

Brown, Harcourt. Scientific organizations in seventeenth century France (1620-1680). xxii+306 p. (*History of Science Society publications*, new series no. 5). Baltimore, WILLIAMS & WILKINS, 1934. ISIS

Reviewed by J. PELSENEER, *Isis* 22, 542, 1935.

Morison, Samuel Eliot. The founding of Harvard College. xxi+472 p., 48 illus. (The Tercentennial history of Harvard College and University, 1636-1936, vol. 1). Cambridge, Mass., Harvard University Press, 1935 (\$ 5). ISIS

This is a very erudite and very spirited and entertaining account of the first years of Harvard College. A large part of this volume is devoted to the foreign origins of Harvard College: Cambridge, Oxford, Dublin, Scotch, Dutch, Italian and Spanish. In Appendix C the author proves that Harvard was the first college in the modern sense (comparable to European universities) north of Mexico. The oldest university of the New World is San Marcos of Lima founded in 1551; the University of Mexico founded in the same year came to an end c. 1850, the present National University being established only in 1910. Appendix D contains a complete reprint of the *New Englands first fruits* (London, 1643), one of the most remarkable "promotion pamphlets" ever published. G. S.

XVIIth Century (second half)

A. — *Mathematics*

Andrade, E. N. da C. NEWTON's early notebook. *Nature* 135, 360, 1935. ISIS

Blüh, Otto. NEWTON and SPINOZA. *Nature* 135, 658, 1935. ISIS

Schlosser, Edgar Oswin. Die Rezensionstätigkeit von LEIBNIZ auf

mathematischen und physikalischen Gebiet. Diss. Heidelberg, Bottrop i.W., 59 p., 1934. ISIS

This is a thoroughly documented publication with a sketch of the life and work of LEIBNIZ, and a full discussion of his reviewing activities. Synopses of 44 reviews, with commentary, are given. R. C. A.

C. — *Natural sciences*

Van Seters, W. H. LEEUWENHOECK-Ceramik. *Bijdragen tot de geschiedenis der geneeskunde* 15, 70-74, 4 pl., 1935. ISIS

D. — *Medical sciences*

Beekman, Fenwick. BIDLOO and COWPER, anatomists. *Annals of medical history* 7, 113-29, 7 fig., 1935. ISIS

Chinard, Gilbert. An early treatise on tropical medicine. *Bull. of the Institute of the History of Medicine* 3, 313-19, 1 pl., 1935. ISIS

Apropos of ETIENNE BIZET de FLACOURT (1607-1660): Histoire de la grande isle de Madagascar, 1658, Relation id., 1658. The short chapter dealing with tropical diseases is quoted *in extenso* (p. 315-19). G. S.

Diepgen, Paul. Zum 275. Geburtstag FRIEDRICH HOFFMANN'S. *Deutsche Medizinische Wochenschrift*, Nr. 10, 3 p., 1935. ISIS

E. — *Alia*

(**Comenius, John Amos**; 1592-1670). The bones of COMENIUS. *Nature* 135, 272, 1935. ISIS

Stimson, Dorothy. Puritanism and the new philosophy in 17th century England. *Bull. of the Institute of the history of medicine* 3, 321-34, 1935. ISIS

Wolfson, Harry Austryn. The philosophy of SPINOZA: unfolding the latent processes in his reasoning. 2 vols. Cambridge, Harvard University Press, 1934. ISIS

Reviewed by LOUIS HARAP, *Isis* 22, 543-46, 1935.

XVIIIth Century (whole and first half)

A. — *Mathematics*

Emch, Arnold F. The Logica demonstrativa of GIROLAMO SACCHERI. II. *Scripta mathematica* 3, 143-52, 1935. ISIS

- Rebel, Otto Julius.** Der Briefwechsel zwischen JOHANN (I) BERNOULLI und dem Marquis DE L'HOSPITAL in erläuternder Darstellung. Diss. Heidelberg. Böttrop, i.W., 46 p., 1934. ISIS

This dissertation deals with 25 letters (dated 1697-1701) of JOHN BERNOULLI (1667-1748), and 62 letters (dated 1692-1707) of L'HOSPITAL, which are to be seen at the Swedish Academy of Sciences, Stockholm; copies are in the Herzogl. Bibliothek in Gotha. Other copies are to be found in Florence. Pages 1-15 are occupied with a "Biographie des Marquis de l'HOSPITAL"; p. 16-22 with "Einführung in dem Briefwechsel" gives a list of the letters with dates. Ten letters of L'HOSPITAL and one of BERNOULLI are printed (p. 23-41) and with three pages of "Anmerkungen zum Briefwechsel" und "Lebenslauf" the dissertation closes. All the work of the dissertation is based on copies, not the original letters. R. C. A.

- Wollenschläger, Karl.** Der mathematische Briefwechsel zwischen JOHANN I. BERNOULLI und ABRAHAM DE MOIVRE. Erstmal hrsg. und mit Anmerkungen versehen. Diss. Heidelberg, Basel, 1933; reprinted, with title page and Lebenslauf, from *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 43, 151-317, 1933. ISIS

The Swedish Academy of Sciences has 1027 letters addressed to JEAN BERNOULLI (1667-1748) and 549 letters written by him. This dissertation based on copies of certain of these letters in the Herzogliche Bibliothek at Gotha. "ABRAHAM DE MOIVRES Leben und seine mathematische Schriften" are dealt with in pages 165-70 und an "Inhaltsübersicht des Briefwechsels zwischen JOHANN BERNOULLI und ABRAHAM DE MOIVRE" is given p. 170-77. Nineteen letters (10 of DE MOIVRE and 9 of BERNOULLI) are printed in full p. 178-299. Commentary follows to p. 315. Another letter of BERNOULLI (to FALCONER), from the original in Gotha, is given on p. 315-317. R.C.A.

C. — Natural sciences

- Faucci, Ugo.** Contributo alla storia della "dottrina parassitaria delle infezioni" sua connessione colla scoperta dell "origine acarica della scabbia." *Rivista di storia delle scienze mediche* 25, 207-65, 1934. ISIS

D. — Medical sciences

- Goulard, R.** Rapport en justice d'un maître-chirurgien briard (XVIII^e siècle). *Bull. de la société franç. d'hist. de la méd.* 28, 368, 1934. ISIS
- Hoffman, Max.** Die Lehre vom plötzlichen Tod in LANCISI Werk "De subitaneis mortibus." *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 6, 60 p., Berlin, EBERING, 1935. ISIS
- Apropos of GIOVANNI MARIA LANCISI: De subitaneis mortibus (Roma 1707).

Mauclaire, Dr. Un portrait non gravé du chirurgien CLAUDE NICOLAS LE CAT (1700-1768) et peint par le Chevalier SIXE, d'Evreux. *Bull. de la société franç. d'hist. de la méd.* 28, 337-56, 7 fig., 1934. ISIS

Riesman, David. Dr. RICHARD MEAD and the motto of the College of physicians of Philadelphia. *Medical life* 42, 187-201, 1935. ISIS

E. — *Alia*

Drake, T. G. H. Infant welfare laws in France in the eighteenth century. *Annals of medical history* 7, 49-61, 7 fig., 1935. ISIS

Drouet, Joseph. L'esprit pratique de l'Abbé de SAINT-PIERRE. *Revue du dix-huitième siècle* 2, 161-74, 1914. ISIS

Piggott, Stuart. STUKELEY, AVEBURY and the Druids. *Antiquity* 9, 22-32, 5 pl., 1935. ISIS

WILLIAM STUKELEY born in 1687 "died in 1756 at the age of 78, being at that time rector of St. George's, Queen's Square, Holborn. His work during the ten years from 1718 shows him to have been the finest field-archaeologist that England had so far seen or was to see for a century; for the next thirty-five he was instrumental in propagating theories the very imbecility of which seems to have endeared them for ever to the public mind. Who shall apportion praise or blame to so contradictory a character?"

Villey, P. A propos de la lettre sur les aveugles. *Revue du dix-huitième siècle* 1, 410-33, 1913. ISIS

Le lettre sur les aveugles de DIDEROT, 1749.

XVIIIth Century (second half)

A. — *Mathematics*

Funkhouser, H. Gray; Walker, Helen M. PLAYFAIR and his charts. *Economic history* 3, 103-09, 4 fig., 1935. ISIS

"The man who invented outright the graphic method of representing statistical data has had so little recognition that his name is not even to be found in the *Encyclopaedia Britannica*. Many beautiful examples of the line graph, bar graph, circle graph and pie diagram were published nearly a century and a half ago by WILLIAM PLAYFAIR, who accompanied them with pointed expositions of the advantages of the new method for the discovery and analysis of economic trends, but whose work is to-day known to relatively few persons." WILLIAM PLAYFAIR (1759-1823) was a younger brother of JOHN PLAYFAIR (1748-1819), mathematician and geologist. G. S.

- Jelitai, Joseph.** Le mathématicien hongrois PAUL SIPOS (1759-1816).
Archeion 16, 298-306, 1934. ISIS
- Sanford, Vera.** PIERRE SIMON LAPLACE. *Mathematics Teacher* 28,
111-13, frontispiece, 1935. R. C. A. ISIS
- Sanford, Vera.** ADRIEN MARIE LEGENDRE *Mathematics Teacher* 28,
182-84, port., 1935. R. C. A. ISIS
- Sanford, Vera.** GASPARD MONGE. *Mathematics Teacher* 28, 238-40,
port., 1935. R. C. A. ISIS

B. — *Physical sciences and technology*

- Gullström, S.** CARL WILHELM SCHEELE. Einige Irrtümer früherer
Biographen. Das gefundene Porträt. *Vorträge* 1934, 179-88, *Gesell-*
schaft für Geschichte der Pharmazie, 1934. ISIS
- McKie, Douglas.** DANIEL RUTHERFORD and the discovery of nitrogen.
With translations from his "Dissertatio inauguralis de aere fixo
dicto, aut mephitico" (1772). *Science Progress* 29, 650-60, 1935.
ISIS
- Metzger, Hélène.** La philosophie de la matière chez LAVOISIER. 47 p.
(Actualités scientifiques et industrielles 218. Exposés d'histoire et
philosophie des sciences publiés sous la direction de ABEL REY, 2).
Paris, HERMANN, 1935 (10 fr.). ISIS
- Résumé des conférences faites à l'Institut d'histoire des sciences et des
techniques de l'Université de Paris. Le problème de l'élément; Analyse
mentale et analyse chimique; Classification, langage chimique et théorie de
l'acidité; Les sels, l'ancienne doctrine des affinités et les prévisions théoriques;
Le concept de gaz; Le concept de calorique, la structure de la matière et
la lumière; Appendice sur la destruction du phlogistique et la théorie de
la combustion. G. S.
- Weeks, Mary Elvira.** The scientific contributions of the DE ELHUYAR
brothers. *Journal of chemical education* 11, 413-19, illus., 1934.
ISIS
- Apropos of JUAN JOSÉ DE ELHUYAR and his brother FAUSTO DE ELHUYAR
(Logroño 1755 — Madrid 1833), who were the first to isolate tungsten. A
very interesting chapter of the history of chemistry in Spain and Mexico.
G. S.

D. — *Medical sciences*

- Diepgen, Paul.** NOVALIS (1772-1801) und die romantische Medizin. *Klinische Wochenschrift* 13, 8 p., 1934. ISIS
- Schoor, Oscar van.** Une préparation publique de la thériaque d'Andromaque à Liège (1774). *Vorträge* 1934, 15-21, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Waring, Joseph Ioor.** Medicine in Charlestown 1750-1775. *Annals of medical history* 7, 19-26, 1935. ISIS

E. — *Alia*

- Bessmertny, Bertha.** Les principaux ouvrages sur l'histoire des sciences parus en France pendant le XVIII^e siècle. *Archeion* 16, 325-28, 1934. ISIS
- Dehérain, Henri.** Un maître de SILVESTRE DE SACY, l'orientaliste ETIENNE LE GRAND. *Journal des savants*, 17-31, 1935. ISIS
- Pinot, Virgile.** ROUSSEAU en Suède. Les causes de son succès et de son influence. *Revue du dix-huitième siècle* 2, 389-96, 1914. ISIS

XIXth Century (whole and first half)

A. — *Mathematics*

- Archibald, R. C.** GAUSS's *Disquisitiones arithmeticae* and the French Academy of sciences. *Scripta mathematica* 3, 193-96, 1935. ISIS
- Bolzano, Bernard** (1781-1848). *Schriften*. Herausgegeben von der Königlichen Böhmischen Gesellschaft der Wissenschaften, Bd. 4. Der Briefwechsel B. BOLZANO's mit F. EXNER. Herausgegeben mit Einleitung und Anmerkungen von EDUARD WINTER. xx+138 p. Prag, Königliche Böhmische Gesellschaft der Wissenschaften, 1935. ISIS

The first volume of the edition of BOLZANO's works published by the Royal Bohemian Academy appeared in 1930 (*Isis* 15, 353-5). The present volume contains BOLZANO's German correspondence with the philosopher FRANZ EXNER (Vienna 1802 — Padua 1853). It is of special interest for the history of logic and general science. The editor had added an introduction (14 p.) and notes.

G. S.

Ernst, Wilhelm. JULIUS PLÜCKER. Eine zusammenfassende Darstellung seines Lebens und Wirkens als Mathematiker und Physiker auf Grund unveröffentlichter Briefe und Urkunden. Inaugural Dissertation. 91 p. Bonner Universitäts-Buchdruckerei, 1933.

ISIS

Contents : 1. Jugend und Studienzeit; 2. P.'s Wirken als Mathematiker; 3. P.'s Wirken als Physiker; 4. P.'s Persönlichkeit.

Lorey, Wilhelm. FRIEDRICH LUDWIG WACHTER (1792-1817). Ein Schüler von GAUSS. *Archeion* 16, 307-15, 1934.

ISIS

B. — *Physical sciences and technology*

Andrade, E. N. da C. HUMPHRY DAVY's (1778-1829) experiments on the frictional development of heat. *Nature* 135, 359-60, 1935.

ISIS

Carvalho, Joaquim de. Carta inédita del físico JEAN-BAPTISTE BIOT (1774-1862). *Archeion* 16, 316-23, 1934.

ISIS

Cavazzocca-Mazzanti, Vittorio. L'opera scientifica del farmacista FRANCESCO FONTANA (1794-1867) e la scoperta della salicina. *Archeion* 16, 284-97, 1 fig., 1934.

ISIS

Gunther, Robert T. Plea for the preservation of a scientific library. *Nature* 135, 432, 1935.

ISIS

Apropos of the library of STEPHEN PETER RIGAUD. "STEPHEN PETER RIGAUD, the most eminent historian of British science of his day and professor experimental philosophy at Oxford from 1810 until 1839, who formed a valuable working collection of books on physics, mathematics and astronomy, of which he made great use during the last decade of his life, when, as Savilian professor of astronomy, he was engaged on his great "Works and correspondence of Dr. BRADLEY", 1831, and the much quoted "Correspondence of scientific men of the seventeenth century", published posthumously in 1841."

Hamor, William A. DAVID ALTER and the discovery of spectrochemical analysis. *Isis* 22, 507-10, 1 pl., 1935.

ISIS

DAVID ALTER (1807-81). With portrait.

G. S.

Weeks, Mary Elvira. The scientific contributions of Don ANDRÉS MANUEL DEL RÍO. *Journal of chemical education* 12, 161-66, 1935.

ISIS

"Although A. M. DEL RÍO (1764-1849), the eminent discoverer of the element now known as vanadium, spent most of his active life in Mexico

and a few years in Philadelphia, his services to chemistry and mineralogy are not so widely known and appreciated by American scientists as they deserve to be. He was a schoolmate and honored friend of Baron ALEXANDER VON HUMBOLDT and a worthy colleague of Don FAUSTO DE ELHUYAR, first director of the School of Mines of Mexico."

D. — *Medical sciences*

- Armstrong, John M.** EDWARD PURCELL, the first physician in Minnesota. *Annals of medical history* 7, 169-76, 1 fig., 1935. ISIS
- Barkley, A. H. Dr.** CHARLES CALDWELL (1772-1853). *Annals of medical history* 7, 141-46, 1935. ISIS
- Battistini, Mario.** ANTONIO RAIKEM (1788-1862), di Liegi, medico in Toscana. *Rivista di storia delle scienze mediche* 25, 265-69, 1934. ISIS
- Bluth, Karl Theodor.** Medizingeschichtliches bei NOVALIS. Ein Beitrag zur Geschichte der Medizin der Romantik. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 2, 59 p., Berlin, EBERING, 1934. ISIS
- Guelliot, O.** HECTOR LANDOUZY (1812-64). *Bull. de la soc. franç. d'hist. de la méd.* 24, 7-16, 1935. ISIS
- Hoch, John Hampton.** STEPHEN ELLIOTT (1771-1830). *Annals of medical history* 7, 164-68, 1 fig., 1935. ISIS
- Long, Esmond R.** THOMAS ADDISON and his discovery of idiopathic anemia. *Annals of medical history* 7, 130-32, 1935. ISIS
- Middleton, William S.** WILLIAM WOOD GERHARD (1809-72). *Annals of medical history* 7, 1-18, 5 fig., 1935. ISIS
- Olivier, E.** Document concernant le Dr. ULYSSE TRÉLAT (1795-1879). *Bull. de la soc. franç. d'hist. de la méd.* 28, 369-72, 1934. ISIS
- Randolph, B. M.** The blood letting controversy in the nineteenth century. *Annals of medical history* 7, 177-82, 1935. ISIS
- Rosen, George.** Die Aufnahme der Entdeckung WILLIAM BEAUMONT's durch die europäische Medizin. Ein Beitrag zur Geschichte der Physiologie im 19. Jahrhundert. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 8, 68 p., Berlin, EBERING, 1935. ISIS

Samarelli, Enrico. Un grande iniziato dimenticato (GUGLIELMO ADAMO SERTÜNER). *Vorträge* 1934, 118-35. *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

Sobel, André. Fièvre : 42°. La vie tragique de PHILIPPE I. SEMMELWEIS sauveur des mères. 109 p., 1 port. Paris, ALDOR, 1935. ISIS

This is the poignant story of SEMMELWEIS (1818-1865) baffled by the aberrant behavior of puerperal fever, yet convinced of its contagiousness, opposed by jealous superiors, defeated by the ignorance and incompetence of his aids and the inadequacy of his facilities, treated with disdain and silence by the great of his profession, yet convinced of the truth of his idea and of its value to mothers and children. His story is an epitome of medical conservatism and hostility to new ideas in a period, now happily receding, in which authority was worshiped and utilized. His conclusions antedated the discoveries of pathogenic bacteria by PASTEUR and the exclusion of germs in surgery by LISTER. His proofs were in statistics, which were regarded as insignificant, or were even challenged as vitiated by falsification. Nevertheless, his method was scientific, being based on observation, analysis, experiment, and verification. He was too early for KOCH's formula and failed to use publication skillfully, and was dominated by apostolic passion. He died of blood poisoning in ignorance of the ultimate triumph of his ideas. C. A. K.

Stuck, Walter, G. Historic backgrounds of orthopedic surgery. *Annals of medical history* 7, 36-48, 5 fig., 1935. ISIS

Winans, H. M. Evolution of the concept of fever in the nineteenth century. *Annals of medical history* 7, 27-35, 1935. ISIS

E. — *Alia*

Bergmann, Alfred. Zwei unbekannte Billets ALEXANDER VON HUMBOLDTS an Grossherzog CARL FRIEDRICH VON SACHSEN-WEIMAR. *Mitt. zur Gesch. d. Med. d. Naturw. u. d. Techn.* 34, 97-99, 1935. ISIS

XIXth Century (second half)

A. — *Mathematics*

Antonelli, E. LÉON WALRAS et sa correspondance avec AUGUSTIN COURNOT et STANLEY JEVONS. *Econometrica* 3, 119-27, 1935. ISIS

MARIE ESPRIT LÉON WALRAS (1834-1910), French economist and a disciple of COURNOT, was professor of political economy at Lausanne (1870-1892). His most important works were *Éléments d'économie politique pure* (1874-77)

and *Théorie mathématique de la richesse sociale* (1883). ANTOINE AUGUSTIN COURNOT (1801-77), French mathematician and philosopher, the first successfully to apply mathematics to political economy, was the author of articles in FÉRUSSAC's *Bulletin*, CRELLE's *Journal*, and LIOUVILLE's *Journal*, and of much books as *Recherches sur les principes mathématiques de la théorie des richesses* (1838; English eds. 1897, and 1927), *Traité élém. de la théorie des fonctions et du calcul infinitésimal* 2 v. (1841; second ed. 1856; Germ. ed. 1845), and *Exposition de la théorie des chances et des probabilités* (1843; German ed. 1849).
R. C. A.

Dingler, Hugo. Nochmals "H. HELMHOLTZ und die Grundlagen der Geometrie." *Zeitschrift für Physik* 94, 674-76, 1935. ISIS

B. — *Physical sciences and technology*

Travers, M. W. RAMSAY and helium. *Nature* 135, 619, 1935. ISIS

Tschirch, A. Die Erfindung der panchromatischen Platte und ihre Bedeutung für die Pharmakognosie. *Vorträge* 1934, 196-202, illus., *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

Volhard, Justus. Erinnerungen an JAKOB VOLHARD. *Chemische Novitäten* 26, 89-168, 1935. ISIS

C. — *Natural sciences*

Neveu, Raymond. DAVID LIVINGSTONE, explorateur et médecin. *Bull. de la soc. franç. d'hist. de la méd.* 28, 325-36, 1934. ISIS

Olmsted, J. M. D. The contemplative works of CLAUDE BERNARD. *Bull. of the Institute of the history of medicine* 3, 335-54, 1935. ISIS

D. — *Medical sciences*

Bragman, Louis J. NATHAN JACOBSON (1857-1913) and HENRY LEOPOLD ELSNER (1855-1916). *Medical life* 42, 142-50, 1935. ISIS

Brown, Lawrason. ROBERT KOCH (1843-1910). An American tribute. Part I. *Annals of medical history* 7, 99-112, 1935. (to be cont'd).
ISIS

Carmichael, Emmett B. LA FAYETTE GUILD (1825-70). *Annals of medical history* 7, 147-55, 1935. ISIS

Godman, Herman. WILLIAM HENRY PERKIN (March 12, 1838-July 14, 1907). *Medical life* 42, 151-62, 1935. ISIS

Halford, Francis J. GERRIT PARMELEE JUDD M.D. Surgeon and diplomat of the Sandwich Islands (1828-1873). *Annals of medical history* 7, 156-63, 4 fig., 1935. ISIS

Pomeranz, Herman. DICKENS' doctors. *Medical life* 42, 56-98, 1935. ISIS

XXth Century

A. — *Mathematics*

Einstein, Albert. The world as I see it. Translated by ALAN HARRIS. XVI+19+290 p. London, LANE, 1934. ISIS

Reichinstein, David. ALBERT EINSTEIN. Translated by M. JUERS and D. SIGMUND. London, GOLDSTON, 1934. ISIS

B. — *Physical sciences and technology*

Iliovici, G. Résumé historique du repérage par le son. *L'Enseignement scientifique* 8, 140 ff., 208-13, 1935. ISIS

Seeger, Raymond J. A critique of recent quantum theories. *Proceedings of the National Academy of Sciences* 17, 301-10, 1931; 18, 303-10, 1932. ISIS

D. — *Medical sciences*

Goldstein, Hyman I. Liver therapy in anemia. Earliest clinical and experimental use of liver in anemias (priority). *Medical life* 42, 207-16, 1935. ISIS

Sabin, Florence Rena. FRANKLIN PAINE MALL. The story of a mind. IX+342 p., 8 port. Baltimore, Johns Hopkins Press, 1934. ISIS

E. — *Alia*

De Wulf, Maurice. Revue néoscholastique de philosophie publiée par la Société philosophique de Louvain. Tome 36. 546 p., port., Louvain, 1934. ISIS

Volume entirely devoted to him. Includes biography, bibliography and portrait, and many memoirs some of which are included in the 44th C. B.

PART II

HISTORICAL CLASSIFICATION

I. — ANTIQUITY

I. — ANTIQUITY (*generalities*)

Greiff, Günther. *Verschollenes Wissen.* VI+104 p., 16 pl. Berlin, DE GRUYTER, 1934. ISIS

This book represents but one of the fifteen parts of a more comprehensive work, "Götter und Völker"; it is, therefore, difficult to form a final opinion of its value. The "forgotten knowledge" includes ideas which might be studied under such headings as comparative mythology, origins of the alphabet, calendars of early civilizations, etc. The author reproaches (p. 2) his predecessors for arbitrariness and inconsistency in their treatment of series of names (divinities, animals, abstract ideas) used for designating hours, days, months, years, subdivisions of the lunar orbit, etc.; it is difficult, however, to escape the impression that his own treatment of these series deserves the same reproach. He admits that some of the conclusions reached in his study are "sensational". It is to be regretted that his chapter on Egypt deals with Hellenistic Egypt only; his chapter on "Mexikaner und Maja" contains many statements which rest on a very shaky foundation. The author's ideas concerning the contact — via Scandinavia — between Egypt and Central America are interesting but hardly justified by the evidence he offers.

A. P.

Meier, Hans; Newald, Richard; Wind, Edgar. *Kulturwissenschaftliche Bibliographie zum Nachleben der Antike. Erster Band die Erscheinungen des Jahres 1931.* Herausgegeben von der Bibliothek Warburg. XXVIII+333 p. London, CASSELL, 1934. ISIS

Catalogue raisonné of all the publications concerning the aims followed by the Warburg Library (formerly in Hamburg, now in Thames House, London). These aims are the study of the influence of classical antiquity in all its ramifications and in all times down to our own. Comparable in this respect to our bibliography, the purpose of this one is not only to concentrate all the information available but also to introduce a new point of view, a new kind of synthesis.

The bibliography is divided as follows :

Das Problem des Nachlebens der Antike; Sach- und Typengeschichte; Folklore; Religion und Mythologie; Magie und Naturwissenschaften, 1. Allgemeines, 2. Mathematik, 3. Kosmologie, 4. Geographie, 5. Astrologie und Astronomie, 6. Alchemie und Chemie, 7. Biologie, 8. Pharmakologie; Pflanzenkunde, 9. Medizin; Philosophie; Recht und Staat; Fest-

wesen; Theatergeschichte; Bildtradition; Schrift und Sprache; Epochen und Kulturkreise, Spätantike; Byzanz; Mittelalter; Renaissance, Humanismus, Reformation; Gegenreformation; 17. Jahrhundert; 18. und 19. Jahrhundert; Humanismus und Gegenwart.

It is clear that a great part of the historical field is covered, but the point of view is different from that of other historical bibliographies. The main difficulty will be to restrict the field and prevent it from extending endlessly.
G. S.

Pease, Arthur Stanley. Notes on ancient grafting. *Transactions of the American Philological Association*, 64, 66-76, 1933. ISIS

Elaborate survey of ancient knowledge of grafting. "The more serious ancient instances of grafting between plants of different families were presumably the products, not of scions, but of "grafting by approach." G. S.

2. — EGYPT

De Lint, J. G. De achterzijde van den Papyrus Edwin Smith. *Bijdragen tot de geschiedenis der geneeskunde* 15, 42-51, 1935. ISIS

De Lint, J. G. Le verso du papyrus Edwin Smith. *Bull. de la soc. franç. d'hist. de la méd.* 24, 49-56, 1935. ISIS

Ermann, Adolph; Grapow, Hermann. Wörterbuch der ägyptischen Sprache. 6 vol. Leipzig, 1926-35. ISIS

Reviewed by E. SUYS (S. J.), *Orientalia* 2, 286-88, 1933; by T. GEORGE ALLEN, *American Journal of Semitic Languages* 49, 193-96, 1933.

Grapow, Hermann. Über die anatomischen Kenntnisse der altägyptischen Ärzte. 30 p. (*Morgenland Darstellungen aus Geschichte und Kultur des Ostens*, 26). Leipzig, HINRICH, 1935. ISIS

Brief account of Egyptian anatomy followed by nine pages containing 101 hieroglyphic phrases, referred to by number in the text. G. S.

Quaritch, Bernard. A catalogue of books on Egypt and Egyptology. No. 501, 48 p., 953 items. London, W1, 11 Grafton St., New Bond St., 1935. ISIS

Suys, E. (S.J.). Le dialogue de Désespéré avec son Âme. *Orientalia* 1, 57-74, 1932. ISIS

Suys, E. (S.J.). Le papyrus magique du Vatican. *Orientalia* 3, 63-87, facs., 1934. ISIS

3. — BABYLONIA AND ASSYRIA

Kugler, Franz Xaver (1862-1929). Drei babylonische Planetentafeln der Seleukidenzeit (S+1881, S+2014 und Sp. II 106+112). *Orientalia* 2, 97-116, 1933. ISIS

Aus KUGLERS Nachlass mit einem Überblick über sein Lebenswerk hrsg. von P. J. SCHAUMBERGER.

Langdon, S. H. Correction to the calculated astronomical length of the lunar month in Babylonia. *Journal of the Royal Asiatic Society* 438, 1935. ISIS

Meissner, Bruno. Die babylonisch-assyrische Literatur. 103 p., frontispiece, 96 fig. Wildpark-Potsdam, Akademische Verlagsgesellschaft Athenaion, 1928. ISIS

Introductory account very beautifully illustrated. Divided into 13 chapters as follows: 1. Einleitung; 2. Die Entstehung und Entzifferung der Keilschrift Ausgrabungen in Babylonien und Assyrien; 3. Hymnen und Gebete; 4. Mythen und Epen; 5. Die magische Literatur; 6. Die mantische Literatur; 7. Die Ritualtexte; 8. Die juristische Literatur; 9. Die medizinische Literatur; 10. Die philosophische Literatur; 11. Die naturwissenschaftliche Literatur; 12. Die historische Literatur; 13. Die philologische Literatur. G. S.

Modi, Sir Jivanji Jamshendji (1854-1933). The Mandaeans (the so-called Christians of St. John, the Baptist) of the Euphrates Valley. Influence of Zoroastrianism upon their creed, manners and customs. *Journal Cama Oriental Institute*, no. 23, 17-91, 1932. ISIS

Schneider, Nikolaus. Der kultische Ursprung der Monatsnamen in Umma. *Orientalia* 1, 223-30, 1932. ISIS

Schneider, N. Der Monatskalender von Adab (Ud-nun-ki). *Orientalia* 1, 89-90, 1932. ISIS

Schneider, Nikolaus. Die Schaltjahre der Drehem- und Djoḥaurkunden. *Orientalia* 2, 150-62, 1933. ISIS

Thureau-Dangin, F. La composition des briques d'Arslan-Tash. *Revue d'Assyriologie et d'archéologie orientale* 32, 87-88, 1935. ISIS

"L'analyse, et c'est là le résultat le plus intéressant, décèle, dans la composition des briques et du mortier, une quantité notable de chaux. C'est donc par l'addition, non seulement de paille hachée, mais aussi de chaux, que les Assyriens donnaient à l'argile crue le liant et la consistance nécessaires pour son emploi dans la construction."

4. — GREECE

- Edelstein, Ludwig.** The development of Greek anatomy. *Bull. of the Institute of the History of Medicine* 3, 235-48, 1935. ISIS
- Robert, Louis.** Les Asklepieis de l'Archipel. *Revue des études grecques* 46, 423-42, 1933. ISIS
- Seeger, Raymond J.** The beginnings of physics. I. The quest for general principles. *Journal of the Washington Academy of Sciences* 24, 501-16, 1934. ISIS

II. — MIDDLE AGES

6. — MIDDLE AGES (*generalities*)

- Byrne, Eugene H.** Some mediaeval gems and relative values. *Speculum* 10, 177-87, 1935. ISIS
- Cross, Samuel H.** Mediaeval Russian contacts with the West. *Speculum* 10, 137-44, 1935. ISIS
- David, C. W.** American historiography of the Middle Ages 1884-1934. *Speculum* 10, 125-37, 1935. ISIS
- Guitard, E. H.** Les eaux minérales en Occident dans le haut Moyen Age (du V^e au VIII^e siècles). *Vorträge* 1934, 82-88, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Hurd-Mead, Kate Campbell.** Concerning certain medical women of the late Middle Ages. *Medical life* 42, 111-28, 1935. ISIS
- Jeanselme, E.** (1858-1935). Conseils de régime et d'hygiène donnés aux pèlerins qui s'acheminaient vers la terre sainte. *Bull. de la soc. franç. d'hist. de la méd.* 24, 17-39, 1935. ISIS
- Mansion, Augustin.** La théorie aristotélicienne du temps chez les péripatéticiens médiévaux. AVERROËS-ALBERT LE GRAND-THOMAS D'AQUIN. *Rev. néoscol. de phil.* 36, 275-307, 1934. ISIS
- Thompson, Daniel V. jr.** Medieval color-making: *Tractatus qualiter quilibet artificialis color fieri possit*, from Paris, B.N., Ms. latin 6749^b. *Isis* 22, 456-68, 1935. ISIS

"In the *Appendix* to Cambridge, Gonville and Caius College, Ms. 181, published by DOROTHEA WALEY SINGER in her article, "MICHAEL SCOT

and alchemy," there are four rules for the manufacture of blue pigments, and one rule for gilding. None of these rules is frequently met with in medieval tracts on art technology, but a few recurrences may profitably be noted. Most extensive are those in a short *Tractatus qualiter quilibet artificialis color fieri possit* contained in the fifteenth century Paris, Bibliothèque Nationale, Ms. *latin* 6497^b, fols. 61r^o-62v^o, the text of which is printed for the first time herewith." "The text of the tract in Paris Ms. *latin* 6749^b probably represents an abridgment of a longer work. Its full title promises a description of the manufacture and sophistication of every sort of artificial color, of the mixture of one color with another, and of the identification of the colors. Actually it deals only with the manufacture and sophistication and identification of blues, with the manufacture of white lead, minium and *lazurium* in the sense of vermilion, and with chrysography, argyrophy and their substitutes. There is, for example, no mention of verdigris, one of the outstanding "artificial" colors; and the section on mixtures promised by the title seems to have been omitted entirely."

Van Steenberghe, Fernand. *Le mouvement des études médiévales.*
Rev. néoscol. de phil. 36, 475-512, 1934. ISIS

III. — ORIENTAL SCIENCE AND CIVILIZATION

8. — CENTRAL ASIA

Semičov, B. V. *Die tibetische Medizin bei den Burjaten (Die burjatisch-mongolische Expedition des Botanischen Gartens der Russischen Akademie der Wissenschaften).* *Janus* 39, 1-36, 1 fig., 1935.
ISIS

Ward, Francis Kingdon. *A plant hunter in Tibet.* 317 p. London, CAPE, 1934. ISIS

EASTERN ASIA

(Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined)

Lattimore, Owen. *The Mongols of Manchuria: their tribal divisions, geographical distribution, historical relations with Manchus and Chinese, and present political problems.* 311 p., maps. New York, DAY, 1934. ISIS

Reviewed by C. W. BISHOP, *Geographical review* 25, 349, 1935.

Nakao, Manzo. *Honzo no shichô (History of herb medicine in the Orient).* *Tôyô shichô*, no. 3, 61 p. Tokyo, IWANAMI, 1935. ISIS
S. S.

9. — INDIA

Acharya Prasanna Kumāra. MĀNASĀRA on architecture and sculpture, 5 volumes with an encyclopaedia, introduction, text, translation and 157 pl. Vol. 3 : MĀNASĀRA, Sanskrit text with critical notes, XXIV+11+510+311 p. Vol. 4 : Architecture of MĀNASĀRA, translation in English, LIX+793 p. Vol. 5 : Architecture of MĀNASĀRA. 157 pl. London, Oxford University Press, 1934. ISIS

Reviewed by H. ZINNER, *OLZ* 38, 331-33, 1935.

Bailey, T. Grahame. A history of Urdu literature. XII+120 p. (Heritage of India series). Calcutta, Association Press, 1932. ISIS

Reviewed by J. V. S. WILKINSON, *Bulletin of the School of Oriental Studies* 7, 236-37, 1933; by J. C. TAVADIA, *OLZ* 37, 52-54, 1934.

Banerji, Rakhhal Das. History of Orissa from the earliest times to the British period. Vol. I-II. XII+351 p.; XX+481 p. Calcutta, CHATTERJI, 1930-31. ISIS

Reviewed by STEN KONOW, *OLZ* 36, 127-28, 1933; by R. BURN, *Journal of the Royal Asiatic Society*, 925-27, 1933.

Belvalkar, Shripad Krishna; Ranade, R. D. History of Indian philosophy. Vol. VII : Indian mysticism : mysticism in Maharashtra by R. D. RANADE. v+46+494 p. Poona, Aryabhusan Press, 1933. ISIS

Reviewed by W. RUBEN, *OLZ* 37, 644-46, 1934; by J. C., *Bulletin of the School of Oriental Studies* 7, 676-78, 1934.

Chakladar, Haran Chandra. Social life in ancient India : Studies in VĀTSYĀYANA's *Kāmasūtra*. I+II+212 p. (Greater India Society Publication, no. 3). Calcutta, 1929. ISIS

Reviewed by L. D. BARNETT, *Journal of the Royal Asiatic Society*, 930-32, 1930.

Chalmers, Lord. BUDDHA's teachings, being the Sutta-Nipāta or Discourse-collection. Edited in the original Pali text, with an English version by Lord CHALMERS. XXII+300+19 p. (*Harvard Oriental series*, 37). Cambridge, Harvard University Press, 1933. ISIS

Reviewed by W. NORMAN BROWN, *JAOS* 54, 218, 1934; by W. STEDE, *OLZ* 37, 570-72, 1934; by C. A. F. R. D., *Bulletin of the School of Oriental Studies* 7, 661-63, 1934.

- Chopra, Ram Nath.** Indigenous drugs of India, their medical and economic aspects. XXII+655 p. Calcutta, Art Press, 1933. ISIS
- Clark, Walter Eugene.** Indian conceptions of immortality. VII+49 p. (The Ingersoll lecture, 1934). Cambridge, Mass., Harvard University Press, 1934. ISIS
- Coomaraswamy, Ananda K.** The darker side of dawn. 18 p. (*Smithsonian Miscellaneous Collections*, vol. 94, no. 1). Washington, Smithsonian Institution, 1935. ISIS
Study in Hindu mythology and iconography. The Hindu equivalent to "contemplatio in caligine." G. S.
- Dasgupta, Surendra Nath.** Yoga philosophy in relation to other systems of Indian thought. x+380 p. Calcutta, University of Calcutta, 1930. ISIS
- Dasgupta, Surendra Nath.** Indian idealism. XXVI+206 p. Cambridge, University Press, 1933. ISIS
Contents : 1. Beginnings of Indian philosophy; 2, 3. Upanishadic idealism; 4, 5. Buddhist idealism; 6. The Vedānta and kindred forms of idealism.
Reviewed by W. RUBEN, *OLZ* 38, 352-54, 1935.
- Datta, Bhagavad.** The Ramayana of Valmiki : Balakanda (North-Western recension). Critically edited from original MSS. XIV+490 p.+18 p. Lahore, Research Department, D. A. V. College, 1931. ISIS
Reviewed by E. H. JOHNSTON, *Journal of the Royal Asiatic Society*, 181-83, 1933.
- Datta, Bibhutibhusan.** Testimony of early Arab writers on the origin of our numerals. *Bull. Calcutta Math. Soc.* 24, 193-218, 1932. ISIS
- Dayal, Har.** The Bodhisattva doctrine in the Buddhist Sanskrit literature. XIX+392 p. London, KEGAN PAUL, 1932. ISIS
Reviewed by St. SCHAYER, *OLZ* 37, 124-26, 1934.
- Esser, A. Albert M.** Die Ophthalmologie des Susruta, textkritisch bearbeitet, übersetzt und mit Concordanztabellen zu Bhāvamiśra versehen. IV+84 p., 1 fig. (*Studien zur Geschichte der Medizin*, 22) Leipzig, BARTH, 1934. ISIS
Reviewed by REINH. F. G. MÜLLER, *Mitt. zur Gesch. d. Med.* 33, 291, 1934; by ALDO MIELI, *Archeion* 16, 246-48, 1934.

Fenicio, Jacobo (S.J.) (c. 1558-1632). The livro da seita dos Indios orientais (Brit. Mus. Ms. Sloane 1820). Edited with introduction and notes by JARL CHARPENTIER. CIV+252 p. Upsala, ALMQVIST and WIKSELLS, 1933. ISIS

Reviewed by C. E. A. W. OLDHAM, *Journal of the Royal Asiatic Society* 585-87, 1934.

Fick, Richard. Die buddhistische Kultur und das Erbe ALEXANDERS des Grossen. 42 p., 8 pl. (*Morgenland. Darstellungen aus Geschichte und Kultur des Ostens*, 25). Leipzig, HINRICH, 1933. ISIS

Reviewed by H. LOSCH, *OLZ* 38, 183, 1935.

Filliozat, J. Un chapitre de la Hāritasamhitā sur la rétribution des actes. *Journal asiatique* 225, 125-39, 1934 (received March 1935). ISIS

Apropos of the distinction occurring in many Sanskrit (medical and religious) books between diseases which are simply retributive and hence incurable by medical means, and others. G. S.

Gangopadhyay, Radharaman. Some materials for the study of agriculture and agriculturists in ancient India. IV+147 p. Serampore, MUKHERJEE, 1932. ISIS

Reviewed by W. H. MORELAND, *Journal of the Royal Asiatic Society*, 204, 1933.

Girindranāth, Mukhopādhyāya. History of Indian medicine, containing notices, biographical and bibliographical of the Āyurvedic physicians and their works on medicine, from the earliest ages to the present time. 3 vols. (Griffith prize essay for 1911). Calcutta University Press, 1923-29. ISIS

Reviewed by F. FILLIOZAT, *Journal Asiatique* 223, fasc. ann., 102-04, 1933 (received in 1934).

Gowen, Herbert Henry. A history of Indian literature from Vedic times to the present day. XVI+593 p. New York, APPLETON, 1931. ISIS

Reviewed by M. WINTERNITZ, *OLZ* 36, 759-61, 1933.

Grierson, George A. A dictionary of the Kāshmirī language. XXIII+1252 p. (*Bibliotheca Indica*, no. 229). Calcutta, Asiatic Society of Bengal, 1916-1932. (Rs. 120). ISIS

Reviewed by R. L. TURNER, *Journal of the Royal Asiatic Society* 571-73, 1934.

Harrison, Max Hunter. Hindu monism and pluralism as found in the Upanishads and in the philosophies dependent upon them. XIV+324 p. London, Oxford University Press, 1932. ISIS

Reviewed by E. J. THOMAS, *Journal of the Royal Asiatic Society*, 467-68, 1933; *Bull. of the School of Oriental Studies* 7, 675, 1934.

Hauer, Jakob Wilhelm. Der Yoga als Heilweg, nach den indischen Quellen dargestellt. XVIII+159 p. Stuttgart, KOHLHAMMER, 1932.

ISIS

Reviewed by OTTO STRAUSS, *DLZ* 5, 588-92, 1934; by REINHOLD F. G. MÜLLER, *Mitt. zur Gesch. d. Med.* 32, 191, 1933.

Heimann, Betty. Studien zur Eigenart Indischen Denkens. VI+328 p. Tübingen, MOHR, 1930. ISIS

Reviewed by W. RUBEN, *DLZ* 2, 1356-59, 1931.

Hiriyanna, Mysore. Outlines of Indian philosophy. 419 p. London, ALLEN and UNWIN, 1932. ISIS

Reviewed by THOMAS GREENWOOD, *Nature* 131, 855-57, 1933.

Horner, Isaline Blew. Women under primitive Buddhism. Laywomen and almswomen. XXIV+391 p. London, ROUTLEDGE, 1930. ISIS

Huebottter, Fr. Die Sutra über Empfängnis und Embryologie, übersetzt und eingeleitet. 26 p. (*Mitteilg. Deutsch. Gesellsch. f. Natur- u. Völkerkunde Ostasiens*, 26). Leipzig, Asia Major, 1932. ISIS

Reviewed by REINHOLD F. G. MÜLLER, *Mitt. z. Gesch. d. Med.* 32, 191, 1933.

Johnston-Saint, P. An outline of the history of medicine in India. *Royal Society of Arts, Journal* 77, 844-69, 1928-29. ISIS

GEORGE BIRDWOOD memorial lecture.

Kak, Ram Chandra. Ancient monuments of Kashmir. With a foreword by Sir FRANCIS YOUNGHUSBAND and an introduction by A. FOUCHER. XVI+172 p., LXXVII pl. London, India Society, 1933. ISIS

Kirfel, Willibald. Bhāratavarṣa (Indien) textgeschichtliche Darstellung zweier geographischen Purāṇa-Texte nebst Übersetzung. VI+71 p. (Beiträge zur indischen Sprachwissenschaft u. Religionsgeschichte, hrsg. v. J. W. HAUER, 6. H.-). Stuttgart, KOHLHAMMER, 1931. ISIS

Reviewed by JARL CHARPENTIER, *OLZ* 36, 327, 1933.

Kramrisch, Stella. Indian sculpture. xvi+240 p., 116 fig., 1 map. (The heritage of India series). London, Oxford University Press, 1933. ISIS

Reviewed by OTTO STRAUSS, *OLZ* 38, 183-86, 1935.

Laet, Joannes de (1593-1649). The empire of the great Mogol. A translation of DE LAET'S *Description of India and Fragment of Indian history*. Translated by J.S. HOYLAND and annotated by S. N. BANERJEE. xiv+252 p. Bombay, TARAPOREVALA Sons, 1928. ISIS

La Vallée Poussin, Louis de. L'Inde aux temps des Mauryas et des Barbares, Grecs, Scythes, Parthes et Yue-tchi. 377 p., 1 map. (*Histoire du Monde*, 6). Paris, DE BOCCARD, 1930. ISIS

Reviewed by G. COEDÈS, *BEFEO* 30, 447-49, 1930.

Law, Bimala Churn. A study of the Mahāvastu, with a note by A. BERRIEDALE KEITH. x+180 p. Calcutta, SPINK, 1930. ISIS

MacMunn, Sir George Fletcher. The underworld of India. 284 p., 16 pl. London, JARROLD'S, 1933. ISIS

Reviewed in *Nature* 132, 191, 1933.

Ma, Lala Kannoo. Kāma-kalā, a comprehensive survey of erotics, rhetorics and science of music with special reference to sex psychology, with 30 ills; with an introduction by MUNSHI NARAYAN PRASAD ASTHNA. 114 p. Lahore, Punjab Sanskrit Book Depot, 1931. ISIS

Reviewed by HEINRICH ZIMMER, *OLZ* 36, 705, 1933.

Matsumoto, Tokumyo. Die Prajñāpāramitā-literatur; nebst einem Specimen der Suvikrāntavikrāmi-Prajñāpāramitā. vii+29 p. (*Bonner Orientalist. Studien*, h. 1). Stuttgart, KOHLHAMMER, 1931. ISIS

Reviewed by M. W. WINTERNITZ, *OLZ* 36, 759-61, 1933.

Moraes, George Mark. The Kadamba Kula. A history of ancient and mediaeval Karnataka. With a preface by H. HERAS (S.J.). xxiii+504 p., 56 fig. (*Studies in Indian history of the Indian historical research institute St. Xavier's College*, Bombay, no. 5). Bombay, FURTADO, 1931. ISIS

Reviewed by H. LOSCH, *OLZ* 36, 577, 1933.

Müller, Reinhold F. G. Über altindische Anschauungen von Erbkrankheiten. *Schering-Kahlbaum med. Mitt.* 6, 258-60, 1934. ISIS

Müller, Reinhold F. G. On Sattva, Rajas and Tamas in the old Indian medicine. Calcutta, *Journal of Ayurveda* 10, no. 8 and 9, 1934. ISIS

Reviewed by the author, *Mitt. zur Gesch. d. Med.* 33, 207, 1934.

Nanjio, Bunyiu. The Suvarṇaprabhāsa sūtra. A Mahayana text called "The golden splendour," first prepared for publication, revised and edited by HOKEI IDZUMI. XXVIII+222 p. Kyoto, Eastern Buddhist Society, 1931. ISIS

Reviewed by JOH. NOBEL, *OLZ* 36, 572-75, 1933.

Obermiller, E. The sublime science of the great vehicle to salvation, being a manual of Buddhist monism. The work of ĀRYA MAITREYA with a commentary by Āryāsaṅga. Translated from the Tibetan with introduction and notes. *Acta Orientalia* 8, 81-306, London, 1931. ISIS

Reviewed by ST. SCHAYER, *OLZ* 36, 575-76, 1933.

O'Malley, Lewis Sydney S. Indian caste customs. IX+190 p. Cambridge, University Press, 1932. ISIS

Reviewed by H. VON GLASENAPP, *OLZ* 37, 128, 1934.

Payne, Ernest Alexander. The Śāktas; an introductory and comparative study. 153 p., 6 ills. (The religious life of India). London, Oxford University Press, 1933. ISIS

Reviewed by JOHN WOODROFFE, *Journal of the Royal Asiatic Society*, 385-87, 1935.

Rangāchārya, V. History of pre-Muslim India. Vol. 1, Prehistoric India. VII+247 p. Madras, Huxley Press, 1929. ISIS

Reviewed by J. ALLAN, *Journal of the Royal Asiatic Society*, 149, 1934.

Ray, Hem Chandra. The dynastic history of northern India; early mediaeval period. With a foreword by L. D. BARNETT. Vol. 1. XL+664 p.+II p., 10 maps. Calcutta, University Press, 1931. ISIS

Reviewed by J. ALLAN, *Journal of the Royal Asiatic Society*, 982-83, 1933.

Rhys Davids, (Mrs.) Caroline A. A manual of Buddhism for advanced students. XVII+342 p. London, SHELDON, 1932. ISIS

Reviewed in *Jewish Quarterly Review* 23, 303, 1933.

Ruben, Walter. Materialismus im Leben des alten Indien. *Acta Orientalia* 13, 128-62, 177-225, 1934. ISIS

Sankalia, Hasmukh D. The university of Nālandā. With a preface by H. HERAS. 400 p., illus. Madras, PAUL, 1934. ISIS

Sankaran, A. Some aspects of literary criticism in Sanskrit, or the theories of Rasa and Dhvani. xx+161 p. Madras, University Press, 1929. ISIS

Sāstri, Sāmbasiva. Hrdayapriya of PARAMEṢVARA. 412 p. (*Trivandrum Sanskrit series*, no. 111). Trivandrum, 1931. ISIS

Reviewed by J. FILLIOZAT, *Journal asiatique* 223, fas. ann., 109-10, 1933 (received in 1934). "L'ouvrage édité à Trivandrum dans les "Series" déjà bien connues est un traité de médecine moderne ou plutôt une version modernisée d'un ancien traité, la fameuse Aṣṭāṅghrdayasamhitā de VĀGHAṬA."

Sastri, P. S. Subrahmanya. Tolkāppiyam. Vol. 1, edited with a short commentary in English. x+105 p. (*Madras Oriental series*, no. 3). Madras, Journal of Oriental Research 1930. ISIS

Reviewed by M. S. H. THOMPSON, *Journal of the Royal Asiatic Society*, 161, 1933. "This is an English edition, with an index of words, of Tolkāppiyam, the earliest grammar extant of ancient Tamil."

Schayer, Stanislaw. Ausgewählte Kapitel aus der Prasannapadā. (V, XII, XIII, XIV, XV, XVI). Einleitung, Übersetzung und Anmerkungen. xxxiii+127 p. (*Poln. Akad. d. Wiss. Mémoires de la commission orientaliste*, Nr. 14). Krakau, Poln. Akad. d. Wiss., 1931. ISIS

Reviewed by W. RUBEN, *DLZ* 5, 1931-33; by OTTO STRAUSS, *OLZ* 36, 571-72, 1933.

Schomerus, Hilko Wiardo. Indien und das Christentum. I : Indische Frömmigkeit. II. Das Ringen des Christentums um das indische Volk. III. Das Eindringen Indiens in das Herrschaftsgebiet des Christentums. viii+198 p.; vii+265 p.; viii+231 p. Halle a.S., Buchhandl. des Waisenhauses, 1931/33. ISIS

Reviewed by HANS LOSCH, *OLZ* 37, 335-37, 1934.

Sewell, Robert (1845-1925). The historical inscriptions of South India collected till 1923 and outlines of political history. Edited by S. KRISHNASWAMY AYYANGAR. xiv+452 p., 1 map. Madras, Diocesan Press, 1932. ISIS

Reviewed by J. ALLAN, *Journal of the Royal Asiatic Society* 207, 1935.

Shah, Chimanlal Jaichand. Jainism in northern India, 800 B.C.-

A.D. 526. XXIV+292 p., 26 pl., 2 maps. (*Studies in Indian history of the Indian historical research institution St. Xavier's College, Bombay, no. 6*). London, LONGMANS, 1932. ISIS

Reviewed by ARTHUR WALEY, *Antiquity* 7, 256, 1933; by GIUSEPPE TUCCI, *Journal of the Royal Asiatic Society* 212, 1934; by WALTHER SCHUBRING, *OLZ* 37, 126-28, 1934.

Sinha, Jadunath. Indian psychology : perception. XVI+384 p. London, KEGAN PAUL, 1934. ISIS

Stcherbatsky, Th. (Fedor Ippolitovich Shcherbatskii). Buddhist logic. 2 vols., XII+560 p., VI+469 p. Cambridge, Harvard Univ. Press, 1934. ISIS

Vol. 1 reviewed by W. RUBEN, *OLZ* 37, 330-35, 1935; by PAUL MASSON-COURSIL, *Rev. de l'hist. des religions* 108, 287-89, 1933.

Strauss, Otto. Udgīthavidyā. (*Sitzungsberichten d. Preuss. Akad. d. Wiss., phil.-hist. Kl.* 1931). Berlin, DE GRUYTER, 1931. ISIS

Reviewed by WALTER RUBEN, *DLZ* 4, 1833-36, 1933; by F. OTTO SCHRADER, *OLZ* 36, 761-63, 1933.

Subramanian, K. R. Buddhist remains in Āndhra and the history of Āndhra between 225 and 610 A.D. With a foreword by G. JOUVEAU-DUBREUIL. XXV+186 p. Waltair, Āndhra University, 1932. ISIS

Sukthankar, Viṣṇu Sitārāma (and many others). The Mahābhārata for the first time critically edited. Illustrated from ancient models by SHRIMANT BALASAHIB PANT PRATINIDHI, Ruler of Aundh. Ādi-parvan. Fascicules 6 and 7. 240 p., 5 ill.; 116+CXVIII p. Poona, Bhandakar Oriental Research Institute, 1932-33. ISIS

Reviewed by R. P. DEWHURST, *Journal of the Royal Asiatic Society*, 443, 1933; by JARL CHARPENTIER, *OLZ* 38, 254-56, 1935.

Vaidya, Parasurama Lakṣmana. The Uvāsagadasāo. The seventh Anga of the Jain Canon. Edited for the use of university students with an introduction, glossary, notes and appendices. XIII+248 p. Poona 4, GOKHALE, 1930. ISIS

Reviewed by WALTHER SCHUBRING, *OLZ* 34, 1083-84, 1931.

Weckerling, Adolf. Indische Medizin. *Biologische Heilkunst*, 13, p. 505 ff., 1932. ISIS

Winternitz, Maurice. A history of Indian literature. Vol. 2; Buddhis t

literature and Jaina literature. Translated from the original German by Mrs. S. KETKAR and Miss H. KOHN and revised by the author. Calcutta, the University, 1933. ISIS

Reviewed by OTTO STRAUSS, *DLZ* 5, 1591-93, 1934.

Woodward, Frank Lee. The book of the gradual sayings (Anguttara-Nikāya) or more-numbered Suttas. Vol. I (ones, twos, threes), transl. with an introduction by Mrs. RHYS DAVIDS. xxii+285 p. (*Pali text society, translation series*, no. 22). London, Oxford University, Press, 1932. ISIS

Reviewed by HANS LOSCH, *OLZ* 36, 703, 1933.

Yajnik, Ramanlal Kanaiyalal. The Indian theatre. Its origins, and its later developments under European influence. With special reference to Western India. 284 p. London, ALLEN & UNWIN, 1933. ISIS

Reviewed by HANS LOSCH, *OLZ* 38, 186, 1935.

10. — CHINA

Buck, Pearl S. All men are brothers (Shui hu chuan). Translated from the Chinese. xiii+1279 p. London, METHUEN, 1933. ISIS

Elaborate review by LIONEL GILES, *Bulletin of the School of Oriental Studies* 7, 623-36, 1934.

Feng, H. Y.; Shryock, J. K. The black magic in China known as *ku*. *Journal of the American Oriental Society* 55, 1-30, 1935. ISIS

"A number of ideas and practices are grouped together under the Chinese term *ku*. These ideas and practices justify the use of the phrase "Black magic"; that is, magic whose purpose is to injure someone. In this sense the word is contrasted with *wu*, "white magic", or magic whose purpose is beneficial. The phrase "black magic" is too general, however, for the Chinese term *ku* refers to certain particular methods of black magic, which are, so far as the authors are aware, peculiar to certain cultures of South-Eastern Asia. In ancient times this specific feature of culture may have been spread over a wider area."

Frichet, Henry. La médecine et l'occultisme en Chine. Avec préface de FOVEAU DE COURMELLES. 218 p. Paris, Editions Astra (1933? 1935?). ISIS

Cet ouvrage, nous dit-on, est puisé aux meilleures sources, mais ces sources ne sont pas indiquées. Par conséquent il est impossible de déterminer ce qu'il y a de bon dans ce livre. L'auteur ne nous inspire aucune confiance.

G. S.

Hartner, W. Chinesische Kalenderwissenschaft. *Sinica : Zeitschrift für Chinakunde und Chinaforschung* 5, 237-45, 1930. ISIS

Herrmann, Albert. Die älteste Reichsgeographie Chinas und ihre Kulturgeschichtliche Bedeutung. *Sinica : Zeitschrift für Chinakunde und Chinaforschung* 5, 232-37, 1 fig., 1930. ISIS

“Zu den wertvollsten Schätzen der ältesten chinesischen Literatur gehört das *Yü Gung*, “*Die Tributleistungen an Yü*”, eins der Bücher der Urkunden, die KONFUZIUS gesammelt und herausgegeben hat. Das Buch enthält nämlich die älteste Reichsgeographie in Form einer Beschreibung der 9 Provinzen, der 9 Berge und der 9 Flüsse und der Grenzen des gesamten Gebiets. Daran schliesst sich eine Darstellung Chinas an, die mit der vorigen nichts gemeinsam hat, da sie lediglich ein Idealbild auf Grund ineinandergeschachtelter Quadrate bringt.”

Mikami, Yoshio. *Sūgaku : Shina shiso* (History of Chinese mathematics). 64 p. (*Tōyō shichō*, no. 2). Tokyo, IWANAMI, 1934. S. S. ISIS

Shinjō, Shinzō. *Tenmon : Shina shisō* (Astronomy in ancient China). 47 p. (*Tōyō shichō*, no. 8). Tokyo, IWANAMI, 1935. S. S. ISIS

11. — JAPAN

Fujikawa, Yū. *Nihon kagaku no tokuhitsu : Igaku* (Japanese medicine: its unique features in the Orient). 47 p. (*Tōyō shichō*, Far Eastern movements of thought, no. 7). Tokyo, IWANAMI, 1935. S.S. ISIS

Sadler, Arthur Lindsay. *Cha-no-yu*. The Japanese tea ceremony. xx+245 p., fig., 1 map. Kobe, THOMPSON, 1933. ISIS

Reviewed by ANNA BERLINER, *OLZ* 38, 258-60, 1935.

Yoshitake, S. Japanese names of the four cardinal points. *Bulletin of the School of Oriental Studies* 7, 91-103, 1933. ISIS

13. — IRAN

Bartholomae, Ch. Notes on a Sasanian law-book. Translated from the German by L. BOGDANOV. *Journal Cama Oriental Institute*, no. 18, VII+67 p., 1931; no. 21, V-40 p., 1932. ISIS

Cavaignac, E. Note on the origin of the Zoroastrian calendar. Translated by HOMI D. BANAJI. *Journal Cama Oriental Institute*, no. 22, 1-6, 1932. ISIS

- Geldner, Karl F.** (1852-1929). Zoroastrian religion in the Avesta. Translated from the original German by JEHANGIR C. TAVADIA. *Journal Cama Oriental Institute* no. 24, 80 p., 1933. ISIS
- Gray, Louis Herbert.** The foundations of the Iranian religions. (Ratanbai Katrak lectures). 228 p. *Journal Cama Oriental Institute*, no. 15, 1929. ISIS
- Lichtwardt, H. A.** Ancient medicine in modern Persia. *Annals of medical history* 7, 81-84, 1935. ISIS
- Pithawalla, M. B.** Geological references in Oriental scriptures. *Journal Cama Oriental Institute*, no. 23, 1-11, 1932. ISIS

14. — ISLAM (also Arabia)

- Kraus, Paul.** Abstracta islāmica (cinquième série, 1932-34, première partie). Histoire des sciences. *Revue des études islamiques* 129-62, 1934. ISIS
- Contents. 1. Livres grecs en traduction arabe : A. Médecine et sciences naturelles, B. Sciences exactes, C. Philosophie antique. 2. Médecine; 3. Mathématiques et arithmologie; 4. Astronomie et astrologie; 5. Musique; 6. Géographie; 7. Alchimie et magie; 8. Divers.
- Mackensen, Ruth Stelhorn.** Moslem libraries and sectarian propaganda. *American journal of semitic languages and literatures* 51, 83-113, 1935. ISIS
- Mackensen, Ruth Stelhorn.** Background of the history of Moslem libraries. *American journal of Semitic languages and literatures* 51, 114-25, 1935. ISIS
- Very valuable contributions to the study of Islamic culture. G. S.
- Ritter, Hellmut.** Orientalische Steinbücher. *Istanbuler Mitteilungen* 3, 1-15, 1935. ISIS
- Catalogue raisonné of MS lapidaries in the Istanbul libraries. Twenty items. Followed by a Persian text of the beginning of the fourteenth century on the manufacture of faience. See note under XIV (1) above. G. S.
- Rochlin, S. A.** Early Arabic printing at the Cape of Good Hope. *Bulletin of the School of Oriental Studies* 7, 49-54, 1933. ISIS

- Sorokin, Pitirim A. ; Merton, Robert K.** The course of Arabian intellectual development, 700-1300 A.D. A study in method. *Isis* 22, 516-24, 1935. ISIS
 Statistical investigation based on SARTON's *Introduction*, three methods of analysis being compiled in tables and graphs. G. S.

PART III

SYSTEMATIC CLASSIFICATION

I. — SCIENCE IN GENERAL

16. — HISTORY OF SCIENCE

- Allen, Frank.** Physical science, ancient and modern. *University of Toronto Quarterly* 3, 146-66, 1934. ISIS
- Binoux, Prix.** 1934. *Isis* 22, 531, 1935. ISIS
- History of science.** Third international congress, Portugal Oct. 1934. Proceedings of the third international congress of the history of science. *Archeion* 16, 337-72, 1934. ISIS
- Perna, Alfredo.** Corsi di storia delle scienze in Italia. *Archeion* 16, 329-36, 1934. ISIS
- Reymond, Arnold.** Réflexions sur l'enseignement de l'histoire des sciences. *Archeion* 16, 265-72, 1934. ISIS
- Sarton, George.** Division of historical research. Section of the history of science of the Carnegie Institution of Washington. Sixteenth annual report for the period extending from July 1, 1933 to June 30, 1934. *Isis* 22, 435-39, 1935. ISIS
- Sarton, George.** Forty-first Critical bibliography of the history and philosophy of science and of the history of civilization (to April 1934—with special reference to Greece and Rome). *Isis* 22, 557-619, 1935. ISIS
 'This forty-first Bibliography contains about 345 items of which 60 deal with Greece and Rome. They have been kindly contributed by six scholars belonging to three different countries.'
- Sarton, George.** Preface to volume XXII. Lusitanian memories. *Isis* 22, 440-55, 1 pl., 1935. ISIS

17. ORGAN. OF SCIENCE. 18. PHILOSOPHY. 19. LOGIC AND THEORY 513

Account on the Third international congress of the history of science, Portugal, October 1934. Illustrated with a reproduction of NUNO GONÇALVES' magnificent portrait of HENRY the Navigator. G. S.

17. — ORGANIZATION OF SCIENCE

(Internal organization is meant, see *ISIS* 1, 195. For external organization, national, or international, see section 55)

Gruenberg, Benjamin C. Science and the layman. *Scientific monthly* 40, 450-57, 1935. *ISIS*

18. — PHILOSOPHY OF SCIENCE

Bliss, Henry Evelyn. The system of the sciences and the organization of knowledge. *Philosophy of science* 2, 86-103, 1935. *ISIS*

Blumberg, Albert E. The nature of philosophic analysis. *Philosophy of science* 2, 1-8, 1935. *ISIS*

Emery, A. Dialectics versus mechanics. A Communist debate on scientific method. *Philosophy of science* 2, 9-38, 1935. *ISIS*

Rashevsky, N. The biophysics of space and time. *Philosophy of science* 2, 73-85, 1935. *ISIS*

II. — FORMAL SCIENCE

(Knowledge of forms)

19. — LOGIC AND THEORY OF KNOWLEDGE

Hahn, Hans. Logique, mathématiques et connaissance de la réalité, Traduction de ERNEST VOUILLEMIN. Introduction de MARCEL BOLL. 51 p. (Actualités scientifiques et industrielles, 226). Paris, HERMANN, 1935 (10 frs.). *ISIS*

Pensée et réalité; Logique et réalité; Mathématique et réalité; Théorie et expérience; Science et métaphysique; Le problème de la vérité et la science unitaire. D'après la préface de M. BOLL: "La thèse fondamentale de cet exposé est le caractère tautologique de la logique et des mathématiques. On admet communément que " la pensée nous fait saisir les rapports réguliers qui existent dans le réel". Si cette opinion était juste, il serait impossible de comprendre " pourquoi ce qui contraint notre pensée contraindrait également le monde. Il faudrait nécessairement introduire, admettre par croyance, une harmonie merveilleuse et préétablie entre le cours de notre pensée et le cours de l'Univers : représentation profondément mystique et, au fond, d'ordre théologique". En parfaite communion d'idées avec CARNAP, la vérité

ne peut donc que s'identifier avec le résultat d'un *contrôle expérimental*, et HAHN ne manque pas d'indiquer ici la parenté de cette conception avec le pragmatisme de J. DEWEY et de W. JAMES. Mais il convient peut-être d'insister sur l'amphibologie inhérente à leur doctrine." G. S.

20. — MATHEMATICS

Altshiller-Court, Nathan. Art and mathematics. *Scripta mathematica* 3, 103-111, port., 1935. ISIS

Archibald, Raymond Clare. MERSENNE's numbers. *Scripta mathematica* 3, 112-19, 1935. ISIS

"The 55 numbers here in question are $M_p = 2^p - 1$, p (prime) = 2, 3, 257."

Bentley, Harry C.; Leonard, Ruth S. Bibliography of Works on Accounting by American Authors. In two volumes. Vol. I, 1796-1900. XXII + 197 p. HARRY C. BENTLEY, Boston, Mass., 1934. ISIS

The title and a statement of the table of contents will be sufficiently descriptive.

Part I (p. 1-104): A chronological bibliography of copyright works on accounting by American authors which are published for general distribution prior to 1901. At least one edition of each work is known to exist. Additional reprints and editions are recorded insofar as they have been verified.

Part II (p. 105-124). A classification of the works listed in Part I except those which would be classified as works on the general principles of book-keeping theory and practice.

Part III (p. 125-142). A chronological bibliography of copyright works on accounting by American authors, published prior to 1901 for restricted use in some one school or correspondence course. At least one edition of each work is known to exist. Additional reprints and editions are recorded insofar as they have been verified.

Part IV (p. 143-182). A chronological bibliography of works on accounting by American authors, copyrighted prior to 1901 but not known to exist in any library and about which there is no complete bibliographical information available.

Author Index (p. 183-197). An attempt has been made to give the date of birth and death of every author.

The second volume of the work will doubtless include a reference to a work by JOHN B. GEIJSBEEK, copyrighted in 1914, and then published at Denver, Colorado: *Ancient Double Entry Bookkeeping Lucas Pacioli's Treatise (A.D. 1494 — the earliest known writer on bookkeeping) reproduced and translated with reproductions, notes and abstracts from MANZONI, PIETRA, MAINARDI, YMPYN, STEVIN, and DAFFORNE.* R. C. A.

Candido, G. PAPPÒ, FAGNANO, STEWART, CHASLES (coincidenze, priorità, generalizzazioni). *Periodico di matematiche* 15, 58-62, 1935.

ISIS

If in a triangle ABC any straight line AD be drawn to BC then $AB^2 \cdot CD + AC^2 \cdot BD = BC \cdot BD \cdot CD + AD^2 \cdot BC$. This is the theorem often referred to as "STEWART'S theorem" (M. STEWART, *Some general theorems...*, Edinburgh, 1746, p. 2-5), but in reality due to ROBERT SIMSON (1741; see J. S. MACKAY, *Edinb. math. sc., proc.*, 10, p. 90-94). If $BD = DC$, we have the theorem in prop. 122, book 7 of the *Mathematical collection* of PAPPUS. SIMSON'S theorem was also given by FAGNANO (see his *Opere matematiche*, 2, p. 36, theorem 10) in a work published in 1750. CHASLES'S generalization is given in chapter 16 of his *Traité de géométrie supérieure* (1852), namely "Etant pris sur une même droite n point a, b, c, \dots , et $(n-1)$ points m, n, p, \dots , on a toujours, quelles que soient les positions de ces points, la relation

$$\frac{am \cdot an \cdot ap \dots}{ab \cdot ac \cdot ad \dots} + \frac{bm \cdot bn \cdot bp \dots}{bc \cdot bd \cdot be \dots} + \dots = 1$$

Other generalizations are referred to.

R. C. A.

Cazalas, E. Carrés magiques au degré n séries numériques de G. TARRY...

Avec un aperçu historique et une bibliographie des figures-magiques. 192 p., pl. Paris, HERMANN, 1934. ISIS

This interesting and excellent work of General CAZALAS has a bibliography (p. 167-91) which will be especially valuable since it supplements that of W. AHRENS (*Mathematische Unterhaltungen und Spiele*, 2, 375-431, 1918). There is a portrait frontispiece of GASTON TARRY (1843-1913) of whom there is a biographical sketch (p. 19-21). R. C. A.

Franklin, Philip. What is topology? *Philosophy of science* 2, 39-47, 5 fig., 1935. ISIS

Keyser, Cassius J. Mathematics and the dance of life. *Scripta mathematica* 3, 120-31, 1935. ISIS

Lecat, Maurice. Erreurs de mathématiciens des origines à nos jours. XII+167 p. Brussels and Louvain, 1935. ISIS

LECAT notes that as long ago as 1886 LUCIANO NAVARRO published a work entitled *Errores en Matematicas* (Salamanca, 103 p.). As a result of a query in *L'Intermédiaire des Mathématiciens* in 1904 a considerable number of errors of mathematicians were noted. The long series of such errors in CANTOR'S *Vorlesungen*, as published in *Bibliotheca Mathematica* will be recalled. To the extensive list of his publications Monsieur LECAT has now added another, dealing with non-historical errors of mathematicians.

The main part of the work (p. 1-114) is taken up with a listing of errors of 284 mathematicians. These are arranged alphabetically according to the names of the mathematicians in connection with which are usually brief biographical notes. Under each name the material is arranged in four columns headed "Matière de l'erreur", "Références bibliographiques", "Découverte et nature de l'erreur", "Références bibliographiques". The errors were made by mathematicians from 450 B. C. to 1916 A. D. and the corrections were published from 1509 to 1934. Detailed indexes make all material in the volumes readily available. Most of the errors listed are in connection

with the theory of numbers; the other subjects are in the fields of algebra, analysis, astronomy, probabilities, calculus of variations, geometry, pure and applied mechanics, celestial mechanics, and optics. Pages 1-136 are printed on only one side of the leaves and lengthwise on the page.

The interest aroused by the volume must be rather mild, but one can admire the assiduity displayed in bringing together such a mass of exact information. It is conceivable that the volume may be useful on very rare occasions.

R. C. A.

Lindemann, F. Zur Geschichte der Polyeder. *Bayerische Akad. d. Wissen., mathem.-naturwissen., Abt., Sitzungsberichte*, 265-75, 1934.
ISIS

This article by the octogenarian discoverer of the transcendence of π is a supplement to his article "Zur Geschichte der Polyeder und der Zahlzeichen," published in the same *Sitzungsberichte* for 1896. The additional historical notes are in connection with the icosahedron, dodekahedron, cubo-octahedron, and hexahedron. For example, various icosahedron museum models seem to have come from Egypt, and one dodekahedron appears to date back to about 800 B.C. considerably before consideration of such a solid by the Greeks.

R. C. A.

Marotte, F. La création de la géométrie dans l'antiquité grecque. *L'enseignement scientifique* 8, 134-40, 1935 (to be cont'd). ISIS

(**Peirce, Charles Sanders**). Collected papers, volume IV: The simplest mathematics. Edited by CHARLES HARTSHORNE and PAUL WEISS. Cambridge, Harvard University Press, 1933. ISIS

Reviewed by W. V. QUINE, *Isis* 22, 551-53, 1935.

Reeve, W. D. The teaching of mathematics in the schools. *Scripta mathematica* 3, 138-42, 1935. ISIS

Smith, David Eugene; Ginsburg, Jekuthiel. A history of mathematics in America before 1900. x+209 p. (*Carus mathematical monographs*, 5). Chicago, Open Court, 1934. ISIS

Reviewed by FREDERICK E. BRASCH, *Isis* 22, 553-56, 1935.

III. — PHYSICAL SCIENCES (Knowledge of inorganic nature)

22. — MECHANICS

(Including celestial and atomical mechanics)

Piggott, H. E. Some ideas on energy and momentum. *Mathematical gazette* 18, 228-44, 1934. ISIS

A brief historical survey of kinetics with special reference to the emergence of the concepts of momentum and energy; and a consideration of the modifications in the teaching of kinetics indicated by the history, especially as regards the concept of impulse.
C. W. A.

23. — ASTRONOMY

Pogo, Alexander. The saros cycle ending with the partial eclipse of January 5, 1935. *Popular astronomy* 43, 7-14, 2 figs, 2 maps, 1935.

ISIS

The first of a series of papers dealing with the periodicity of eclipses, their geographical distribution, and related matters. This series of papers may be considered as prolegomena to a study of the Maya table of ecliptic syzygies, preserved on pages 51 to 58 of the Dresden Codex.

Pogo, Alexander. The eclipse of February 3, 1935—a partial eclipse visible in Central America. *Popular Astronomy* 43, 95-99, 3 figs., 1935.

ISIS

The second of a series of papers dealing with the geographical distribution of eclipses, their periodicity and similar problems. It is to be regretted that a recent investigation of eclipses visible in the Maya territory (R. W. WILLSON, *Astronomical notes on the Maya codices*. Papers of the Peabody Museum, vol. VI, n° 3. Cambridge, Mass., 1924) was based on a table which was supposed "to insure the inclusion of all eclipses that could possibly be visible in the region considered", but which did not include a single partial eclipse due to the unjustified assumption that "no part of the shadow (read: penumbra) of such an eclipse can reach so far south as the latitude of Yucatan and the eclipse should not be included in our table." The very nature of the problem presented by the Maya table of ecliptic syzygies, preserved on pages 51 to 58 of the Dresden Codex, requires a study of the patterns formed by "all eclipses that could be visible" in the Maya territory — and this includes, incidentally, not only partial eclipses of the sun but also lunar eclipses." One of the tables of this paper gives statistics on the visibility of solar eclipses of classical Antiquity, 900 B.C. to A. D. 600.

Pogo, Alexander. Lunar saros series. *Popular astronomy* 43, 207-13, 2 figs, 1935.

ISIS

The third of a series of papers dealing with the periodicity of eclipses. The cylindrical diagram, based on the 223-lunation cycle (6585.3 days), offers a new method for studying the periodicity of chronologically important groups of lunar eclipses. The grouping of eclipses into saros series is important from the point of view of the history of Mesopotamian-Mediterranean astronomy; the *Almagest* reveals traces of Mesopotamian tables of lunar saros series: the occurrence of the inconspicuous partial eclipses closing such series was predicted, observed, and recorded (Apr. 22, 621 B.C.; Apr. 25, 491 B.C.).

Sarton, George. The study of the history of astronomy in Bamberg. *Isis* 22, 530-31, 1935.

ISIS

Tsu, Wen Shion. A statistical survey of solar eclipses in Chinese history. *Popular astronomy* 42, 136-41, 1934. ISIS

On the 920 eclipses recorded, 174 were partial, 335 total, 343 annular, 61 annular-total, and 7 eclipses were "in error and did not take place."
A. P.

24. — PHYSICS

Cahen, Louis. L'établissement des lois quantitatives de l'électrostatique et l'élaboration des théories explicatives (1745-1811). *L'enseignement scientifique* 8, 203-08, 1935 (to be cont'd). ISIS

Mitkevitch, V. Th. Dynamo-electric machine in its historical development. Documents and materials. Collected by D. V. EFREMOV and M. I. RADOVSKIJ. XVIII + 560 p., 155 fig. Leningrad, Academy of Sciences Press, 1934 (in Russian). ISIS

This very elaborate history of the dynamo, with abundant facsimiles and other illustrations is a new proof of the increasing interest of our Soviet friends in the history of science. G. S.

Williams, W. Ewart. Light-waves as units of length. *Nature* 135, 459-61, 496-97, 1 fig., 1935. ISIS

25. — CHEMISTRY, PHYSICO-CHEMISTRY,
INDUSTRIAL CHEMISTRY

Browne, C. A. (and others). Our chemical heritage. 54 p., figs. *American Chemical Society*, New York, 1935. ISIS

Includes: C. A. BROWNE: The story of chemistry in old New York; WILLIAMS HAYNES and L. W. BASS: American chemical chronology. This second part is a very interesting chronological summary from 1608 to 1935.

Davis, Tenney L. Primitive science, the background of early chemistry and alchemy. *Journal of Chemical Education* 12, 3-10, 12 fig., 1935. ISIS

The author concludes this suggestive and well illustrated paper with the following remark: "It would be interesting to discuss other consequences of the ancient doctrine, pre-Christian Trinities for example, and the four humors and four temperaments of the Galenic medicine, but these matters fall beyond the scope of the present paper. The examples which have been considered are sufficient to make clear the persistent continuity of the doctrine of the Two Contraries, of that uninterrupted stream of thought which arose in the darkness before known history, which flowed around, through, and past the glory of Greek philosophy, which has supplied the occult background of science and in many ways still influences the daily language and actions of all of us." G. S.

26. TECHNOLOGY. 27. BIOLOGY. 29. ZOOLOGY. 31. GEOGRAPHY 519

26. — TECHNOLOGY

(For mining, see 32. geology; for industrial chemistry, 25. chemistry.

See also Arts and crafts under 45)

Mumford, Lewis. Technics and civilization. xi+495 p. New York, HARCOURT BRACE, 1934. ISIS

Reviewed by H. T. DAVIS, *Isis* 22, 548-51, 1935.

IV. — BIOLOGICAL SCIENCES

(Knowledge of organic nature)

27. — BIOLOGY

(generalities, "natural history")

Meyer, Adolf. Ideen und Ideale der biologischen Erkenntnis (*Bios*, 1). XIII+202 p. Leipzig, BARTH, 1934. ISIS

Reviewed by ERNST WOLF, *Isis* 22, 546-48, 1935.

Singer, Charles. Histoire de la biologie, préface du Dr. LAIGNEL-LAVASTINE. Edition française par F. GIDON. 613 p. Paris, PAYOT, 1934. ISIS

Reviewed by PIERRE BRUNET, *Archeion* 16, 434-36, 1934.

29. — ZOOLOGY

Gudger, E. W. Snow worms. Enchytraeid worms found in the snow and on the glaciers of high mountains. *Natural history* 23, 450-56, 1 illus., 1923. ISIS

V. — SCIENCES OF THE EARTH

(implying knowledge of both organic and inorganic nature)

31. — GEOGRAPHY AND OCEANOGRAPHY

Boyd, Louise A. The fiord region of East Greenland. With contributions by J. HARLEN BRETZ, O. M. MILLER, WALTER A. WOOD, WILLIAM B. DREW, CHARLES B. HITCHCOCK, and JOHN K. WRIGHT. x+381 p., 361 fig., 14 pl., 2 maps. New York, American Geographical Society Publication no. 18, 1935. ISIS

Miss LOUISE A. BOYD of San Francisco has led four expeditions into the

Arctic on ships chartered by herself. In 1928 she covered ten thousand miles in a vigorous search for AMUNDSEN. In 1931, she carried out a photographic reconnaissance in the fiord region and followed this up by a more ambitious enterprise in 1933 when she took with her a staff of scientific experts. "The fiord region of East Greenland" presents, besides Miss BOYD's admirable series of photographs and her narrative of the expedition of 1933, reports and maps by participants in the expedition and others concerning the work accomplished. The most important part for the readers of *Isis* is the elaborate historical account. "The exploration of the fiord region of East Greenland, a historical outline." prepared by JOHN K. WRIGHT (p. 317-57). G. S.

Henderson, G. C. The discoverers of the Fiji Islands. TASMAN, COOK, BLIGH, WILSON, BELLINGSHAUSEN. XVIII+342 p. London, MURRAY, 1933. ISIS

Reviewed by J. A. WILLIAMSON, *Geographical Journal* 83, 158-59, 1934. Profusely illustrated with charts, portraits of men and ships, and photographs and sketches of scenery. C. W. A.

Mitchell, J. Leslie. Earth conquerors. The lives and achievements of the great explorers. 370 p., 9 port. New York, SIMON and SCHUSTER, 1934. ISIS

The nine explorers selected as conquerors of the unknown all possessed the driving unease of curiosity about the geographically unknown and an unquenchable desire to press on to the ancient Fortunate Isles or their modern equivalents. Those selected are the shadowy LIEF ERICSSON, who discovered the New World; the uncomprehending MARCO POLO, who made real to the Occident the Oriental legend; the braggart COLUMBUS, who awakened Europe to the reality of a Western World but for whom the Spice Islands and the wealth of Cathay were ever elusive; the cowhead, CABEZA DE VACA, who endured untold miseries in his trek from Florida to Culiacan in his search for the City of Ciboa with its streets of gold, and later in the wilderness of the Rio Parana anticipated Colonel FAWCETT in his search for the Golden City of Manoa, always with a firm faith in the perfectibility of the gentle savage and a restraining hand on the cruelty of the conquering Spaniard; the stolid MAGELLAN, the first to steer a prow around the globe; the stoic Jutlander, VITUS BERING, who linked Asia to America, only to turn back; the dour Scot, MUNGO PARK, who sought the secret of the Niger in top hat and umbrella; the ruffian DICK BURTON, who sought out the secret places of Arabia, Africa, and Utah; and NANSEN, the indomitable, who demonstrated that science could aid exploration. The author sketches the lives and achievements of his heroes with a free hand and dramatic, though at times uncritical, effectiveness. C. A. K.

Wright, J. K. Some broader aspects of the history of exploration. A review. *Geographical review* 25, 317-20, 1935. ISIS

32. GEOLOGY, MINERALOGY. 34. ANATOMY. 37. PSYCHOLOGY 521

32. — **GEOLOGY, MINERALOGY, PALAEOONTOLOGY, MINING**
(For palaeobotany, palaeozoology and palaeoanthropology, see
respectively, 28. botany, 29. zoology and 39. prehistory)

Neviani, Antonio. Le più antiche osservazioni sulla geometria e
struttura dei cristalli da PLINIO a STENONE. *Rivista di storia delle
scienze mediche* 17, 24-35, 1935. ISIS

VI. — **ANTHROPOLOGICAL AND HISTORICAL SCIENCES**
(Knowledge of man, past and present)

34. — **ANATOMY**

Hrdlička, Aleš. Ear exostoses. 100 p., 5 pl. (Smithsonian miscella-
neous collection, 93). Washington, Smithsonian Institution, 1935.
ISIS

Includes a history of the subject from the time of J. H. F. AUTENRIETH
(1809) on. G. S.

37. — **PSYCHOLOGY** (*human and comparative*)

Pessoa, Alberto. La collection phrénologique du chevalier DA GAMA
MACHADO. XV^e Congrès international d'anthropologie & d'archéo-
logie, Portugal, 21-30 septembre 1930, 6 p. Paris, NOURRY, 1931.
ISIS

"La collection de modèles en plâtre pour l'étude du système de GALL,
que l'on peut voir au Musée d'anthropologie de la Faculté des Sciences, a
été léguée à l'Université de Coimbre par le chevalier DA GAMA MACHADO,
Portugais excentrique qui passa presque toute sa vie en France, où il mourut
très vieux le 9 juin 1861. C'est, je le crois bien, une des plus importantes
et des plus curieuses collections phrénologiques que l'on puisse trouver en
ce moment. A l'aide d'un vieux cahier de notes, écrit en français et en anglais,
qui a appartenu au chevalier DA GAMA MACHADO, je suis parvenu à organiser
le catalogue de toutes les pièces qui existent actuellement, et qui sont très
nombreuses, comme on va le voir, bien que beaucoup aient été perdues."

39. — **PREHISTORY**

Antevs, Ernst. The spread of aboriginal man to North America.
Geographical review 25, 302-09, 1935. ISIS

"The question of the first peopling of North America has been vigorously
attacked in recent years along many lines. According to the best of our belief
the findings may be summed up thus: The first man to arrive in North America
was of modern type and probably at the Neolithic stage of culture. He came
from north-eastern Asia to Alaska and probably spread along the eastern

foot of the Rocky Mountains where an ice-free corridor had formed some 20000 to 15000 years ago. He seems to have reached the Southwest at the age of transition between the pluvial and the post-pluvial epochs, or roughly 12,000 years ago. Reputed older finds need verification. All the human skeletal remains found in the Americas are, according to ALEŠ HRDLIČKA, of modern types, closely resembling living Indians and Eskimos. Neither Neanderthal man nor any other primivite human species seems to have reached these continents. All sure remains of human culture so far found in the Americas are referred to the Neolithic age by most conservative workers. However, many artifacts are believed by some archeologists to be of Paleolithic age. Thus flint artifacts from Cuba and Hispaniola are regarded by HARRINGTON as Aurignacian in type and the Folsom dart points as Solutrean."

Fisher, Alton K. Additional paleopathological evidence of PAGET's disease. *Annals of medical history* 7, 197-98, 4 fig., 1935. ISIS

Sarton, George. Prehistoric representation and conception of pregnancy. *Isis* 22, 529, 1 pl., 1935. ISIS

Apropos of an early Cycladic idol in the British Museum representing a pregnant woman. G. S.

40. — ETHNOLOGY
(Primitive and popular science)

Copland, B. D. Some Swahili nautical terms. *Bulletin of the School of Oriental Studies* 7, 377-80, 1934. ISIS

Frazer, Sir James George. Creation and evolution in primitive cosmogonies, and other pieces. XII+151 p. London, MACMILLAN, 1935 (\$3.00). ISIS

This is a collection of essays concerned more or less directly with the origin and evolution of man and of human culture. Creation and evolution in primitive cosmogonies appeared in the *Darwin Memorial volume* as "Some primitive theories on the origin of man." It traces in the myths of primitive peoples the existence of the two views, that of creation in which man is fashioned into his existing shape by some god or other powerful being, and that of his evolution from lower forms of life. Other chapters dealing with historical matters include an appreciation of the work of Professor BALDWIN SPENCER on the aborigines of Australia and of that of Canon JOHN ROSCOE on the nature peoples of East Central Africa. This last was marked by keenness of observation, objectivity, and freedom from errors arising from the use of interpreters, for ROSCOE spoke these native languages fluently and had the confidence of these peoples. The tragic tale of CONDORCET, the LUCRETIVUS of the French Revolution, is retold, and his views on evolution and human perfectibility are reviewed. New information regarding the author's own early life, education, and relations to progress in anthropology is found in the last two chapters.

Reviewed in *Nature* 135, 383, 1935.

C. A. K.

- Wright, Jonathan.** Medicine of primitive man—XXIV. *Medical life* 42, 99-108, 1935. ISIS

41. — SUPERSTITION AND OCCULTISM

- Murray, Margaret Alice.** The God of the witches. IX+214 p. London, Low, MARSTON, 1934. ISIS

Reviewed by GEORGE L. BURR, *American historical review* 40, 491-92, 1935. "Miss MURRAY's book is less a new one than a rewriting of her volume on *The witchcult in Western Europe* (1921). Like that it deals not only with the god, but with the worshipers, the priesthood, the rites, of a pagan religion — the worship of a god of fertility — which Miss MURRAY believes to have survived in rural Christendom from palaeolithic days, not only to the end of the Middle Ages, but far into the modern time."

- Sarton, George.** Sleeping along the meridian. *Isis* 22, 525-29, 1935. ISIS

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY

- Henderson, Lawrence J.** PARETO's general sociology. A physiologist's interpretation. VII+119 p. Cambridge, Mass., Harvard University Press. 1935. (\$1.25). ISIS

Very lucid exposition and discussion of VILFREDO PARETO's sociology. It is too brief and too condensed to bear analysis. It will suffice to recommend it to scientists who have no time to read PARETO's immense treatise, but wish to understand his views: HENDERSON's explanation will probably answer their purpose. PARETO's views have been discussed here apropos of HOMANS and CURTIS' *Introduction* (1934, *Isis* 23, 295) and of the English translation of his treatise, *The mind and society* (4 vols. 1935, *Isis* 24, 456-67). G. S.

- Jaffin, George H.** Prologue to nomostatistics. *Columbia law review* 35, 32 p., 1935. ISIS

- Merton, Robert K.** Fluctuations in the rate of industrial invention. *Quarterly journal of economics*, 49, 454-74, 1935. ISIS

Upon the basis of a critical analysis of patent statistics issued in the United States, the author describes the tendency toward a cycle of technical development in the fields of textile machinery, telegraphy, telephony, automobile, aeroplane and radio. The main categories of factors which conduce to such a (roughly cyclical) course of rates of invention are intrinsic, economic and psycho-social. The intrinsic category refers to the progressive limitation of the possibilities of continued invention within a restricted field with an approach to the exhaustion of possibilities. Chief among the economic factors is the conflict between the desires for pecuniary profit and for

524 44. HISTORY OF CIVILIZATION. 50. HISTORY OF MEDICINE

technologic efficiency. The psycho-social factors comprise the tendency for *rentiers* to usurp control of a mature industry with the consequent lack of interest in innovation as contrasted with security. Finally there tends to occur a shift of interest from technologic change to the institution of scientific management (Taylorism).

44. — HISTORY OF CIVILIZATION

(General history, historical methods, biography and chronology)

(History). List of doctoral dissertations in history now in progress at the chief American Universities, December 1934. 62 p. Washington, Department of historical research, Carnegie Institution.

ISIS

Unity history school, Rome 1935. *Isis* 22, 531, 1935. ISIS

VII. — MEDICINE

50. — HISTORY, ORGANIZATION, AND
PHILOSOPHY OF MEDICINE

Bologa, Valeriu L. The crisis in medical thought and in historical synthesis. *Medical life* 42, 202-06, 1935. ISIS

Bologa, Valeriu L. Universitas litterarum und Wissenschaftsgeschichte (Mit besonderer Berücksichtigung der Verhältnisse in Rumänien). *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 7. 26 p., Berlin, EBERING, 1935. ISIS

Dieppen, Paul. Wahrheit und Dichtung in der Medizingeschichte. *Klinische Wochenschrift* 14, 16 p., 1935. ISIS

Findley, Palmer. The midwives' books. *Medical life* 42, 167-86, 1935. ISIS

1. "Little book of women" (Das Frauenbuchlein); 2. The Rosegarten; 3. "The byrth of mankynde"; 4. The "Cheerful booklet"; 5. The book of the art of midwives, etc.

Henderson, L. J. Physician and patient as a social system. *New England Journal of medicine* 212, 819-23, 1935. ISIS

Robertson, William Egbert; Robertson, Harold Frederick. An exhibit of books and memorabilia illustrative of the history of physical diagnosis throughout the ages. *Medical life* 42, 129-41, 1935.

ISIS

Zweig, Stefan. La guérison par l'esprit. Introduction générale. MESMER, [MARY] BAKER EDDY, SIGMUND FREUD. Traduit par ALZIR HELLA et JULIETTE PARY. XXIV+318 p. Paris, STOCK, 1935. ISIS

51. — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES.
PUBLIC HEALTH AND SOCIAL MEDICINE

Molinéry, R. Notes sur le traitement de "l'étsisie" à travers les âges de "Susçruta à Reichenbach." *Bull. de la soc. d'hist. de la méd.* 24, 40-48, 1935. ISIS

Pickett, Justus C. A short historical sketch of osteomyelitis. *Annals of medical history* 7, 183-91, 1935. ISIS

Schoute, D. Enkele volksplagen in het verleden van nederlandsch Indië. *Bijdragen tot de geschiedenis der geneeskunde* 15, 21-37, 52-68, 74-91, 101-18, 1935. ISIS

Zimmermann, E. L. The pathology of syphilis as revealed by autopsies performed between 1563 and 1761. *Bull. of the Institute of the history of medicine* 3, 355-99, 1935. ISIS

52. — HISTORY OF HOSPITALS, OF MEDICAL TEACHING
AND OF THE MEDICAL PROFESSION.
BALNEOLOGY, MEDICAL GEOGRAPHY

Pessoa, Alberto. Hôpitals de Coimbra. 54 p., 12 pl. Coimbra, Imprensa de Universidade, 1931. ISIS

Elaborate study based on archival documents and well illustrated, of the hospitals of Coimbra, the oldest Portuguese university. G. S.

ille, F. C. Ueber Stand und Ausbildung der Hebammen im 17. und 18. Jahrhundert in Chur-Brandenburg. 24 p., 3 illus. (*Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften*, H. 4). Berlin, SCHUSTER, 1934. ISIS

Reviewed by M. A. VAN ANDEL, *Bijdragen tot de geschiedenis der geneeskunde* 15, 69, 1935.

53. — PHARMACY. PHARMACOLOGY. TOXICOLOGY

Baradlay, Joh. Alteingewanderte deutsche Apotheker im Königreich Ungarn. *Vorträge* 1934, 224-31, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

- Dörr, Walter.** Quacksalbenverkäufer. *Vorträge* 1934, 29-40, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Folch y Andreu, Rafael.** Die prähispanischen officinellen Pharmakopöen und die Mitarbeit der Pharmazeuten. *Vorträge* 1934, 212-23, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Gesellschaft für Geschichte der Pharmazie** und 1. Internationaler Kongress für Geschichte der Pharmazie, *Vorträge der Hauptversammlung*. Basel 17. bis 20. mai 1934. VIII+243 p., 9 fig., illus. Mittenwald (Bayern), NEMAYER, 1934. ISIS
Analyzed in 43rd Critical Bibliography.
- Häfliger, J. A.** Einführung zu der Sonderausstellung von pharm.-med. Handschriften und Drucken. *Vorträge* 1934, 189-95, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Irissou, Louis.** Montpellier, centre de formation des compagnons-apothicaires. *Vorträge* 1934, 48-69, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Jermstad, Axel.** Die Geschichte der Pharmazie als Hochschulfach. *Vorträge* 1934, 136-37, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Kofler, L.** Das Vertrauen zur Arznei im Wandel der Zeiten. *Vorträge* 1934, 138-52, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Kremers, Edward.** Die Geschichte des pharmazeutischen Unterrichtes in USA. *Vorträge* 1934, 1-7, figs., *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Orient, Julius.** Die Entstehung der Mönchsorden und geistlichen Ärzte, Spitäler und Apotheken in Siebenbürgen. *Vorträge* 1934, 153-78, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Peters, Dr.** Die Geschichte der Pharmazie als Erziehungsfach des Standes. *Vorträge* 1934, 41-47, *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS
- Schoor, Oscar van.** Die Pharmazie der alten Abtei Orval und das neue Medico-Pharmazeutische Museum Orval's. *Vorträge* 1934, 8-14, illus., *Gesellschaft für Geschichte der Pharmazie*, 1934. ISIS

Toraude, L. G. Les "pharmaciens bibliophiles" de Paris. *Vorträge* 1934, 89-94, illus., *Gesellschaft für Geschichte der Pharmazie*, 1934.

ISIS

Wickersheimer, E. Documents pour servir à l'histoire de la profession d'apothicaire à Strasbourg. *Vorträge* 1934, 70-81, *Gesellschaft für Geschichte der Pharmazie*, 1934.

ISIS

Zörnig, H. Erläuterungen zur Geschichte der Arzneidrogen. *Vorträge* 1934, 203-11, *Gesellschaft für Geschichte der Pharmazie*, 1934.

ISIS

VIII. — EDUCATION

(the methods of accumulating, imparting and diffusing knowledge)

55. — ACADEMIES, SOCIETIES, CONGRESSES. NATIONAL AND INTERNATIONAL ORGANIZATION OF SCIENCE

(Societies and congresses devoted to particular sciences are classified under those sciences. For the internal organization of science—ISIS I, 195—see section 17)

Gabrieli, Giuseppe. *Emblematica Lincea. Reale Accademia Nazionale dei Lincei, Rendiconti della Classe di scienze morali, storiche e filologiche*, ser. 6, vol. 10, 269-84, 8 fig., Rome, 1934.

ISIS

Paris. Académie des sciences. Procès-verbaux des séances de l'Académie tenues depuis la fondation de l'Institut jusqu'au mois d'Août 1835. Publiés conformément à une décision de l'Académie par MM. les secrétaires perpétuels. T. I, 1910, T. X, 1922.

ISIS

Reviewed by GINO LORIA, *Archeion* 16, 404-07, 1934.

58. — CATALOGUES OF SECOND-HAND BOOKS ON THE HISTORY AND PHILOSOPHY OF SCIENCE

Barbazan, Julian. *Catalogo de libros y manuscritos antiguos y modernos, raros o curiosos (ilustrado con facsimiles)*. Numero 13, 121 p., 999 items. Madrid, CONSTANTINO RODRIGUEZ, 4, 1935.

ISIS

Belmore, H. W. Livres anciens : I. mathématique ; II. physique, astronomie, machines ; III. sciences naturelles. Bulletin no. 20. 15 p., 188 items. Rome, 173 via del Babuino, n.d., received April 1935.

ISIS

- Belmore, H. W.** Old medical books. Bulletin no. 21. 15 p., 194 items
Rome, 173, via del Babuino, n.d., received April 1935. ISIS
- Belmore, H. W.** Old and rare books and manuscripts. No. 30.
40 p., 443 items. Rome, 173 via del Babuino; no date (received
in 1935). ISIS
- Blackwell, B. H.** A short list of second-hand books chiefly in science
and mathematics. Catalogue no. 367, 30 p., 1005 items. Oxford,
Eng., 50 & 51 Broad St., 1935. ISIS
- Deutsche Buch-Club, Der.** Autographen III. Antiquariats-Katalog 21,
143 p., 1891 items. Hamburg I, Mönckebergstrasse 21, 1935.
ISIS
- Fock, Gustav.** Botanische und zoologische Iconographie sowie eine
Auswahl seltener, älterer Reisewerke. Antiquariatskatalog, no. 702,
33 p. Leipzig, C 1, 1935. ISIS
- Fock, Gustav.** Chemistry and chemical technology. A selection of
sets of periodicals, collections of dissertations and reprints, text
and handbooks and monographs. 96 p., 2503 items. Leipzig C1,
(received in 1935). ISIS
- Geuthner, Paul.** Science des religions. Fascicule I : Bibliographie,
encyclopédies, périodiques, congrès, ouvrages collectifs, auteurs
anciens, sources pour l'histoire des religions, philosophie religieuse,
morale, science des religions : histoire, méthode, questionnaires,
manuels de l'histoire des religions, histoire générale des religions,
religions comparées. Catalogue 67, 80 p., 1311 items, Paris (VI),
12, rue Vavin, 1935. ISIS
- Goldschmidt, E. P.** Old medical books and a small collection of old
medical instruments. Catalogue no. 37. 65 p., 266 items, illus.
London, W., 45 Old Bond St. (no date, received May 1935). ISIS
- Grafton.** Early works on the steam engine including the locomotive
and steam navigation, 1758-1850, with a supplement of later historical
works. Catalogue 171, 8 p., 78 items. London, W.C.1, Coptic
House, 51 Great Russell St., 1935. ISIS
- Grafton.** Railway literature, books, pamphlets, maps, prints arranged
by subjects and companies. 44 p., 781 items. London, W.C.1, 51
Great Russell St., 1935. ISIS

Leighton, J. & J. Books, bearing on almost all branches of the history of science, medicine, mathematics etc. with reference books, Judaica and other works. Catalogue no. 27, 38 p., 550 items. London, W.C.1, 100 Great Russell St. Bloomsbury, (received April 1935).

ISIS

Lier, R. New acquisitions of old medicine and natural sciences. 100 items. Via S. Felice a Ema, 41, Galluzzo Florence, 1935.

ISIS

Maisonneuve, Gustave-Paul. Catalogue d'un beau mélange d'ouvrages anciens et modernes sur l'histoire, la géographie, les voyages, l'archéologie, l'ethnographie, la linguistique, la philologie, les religions, etc. etc. de l'Asie, l'Afrique et les Amériques. No. 7, 64 p., 868 items. Paris VII^e, 3, rue du Sabot, received in 1935.

ISIS

Nourry, Emile. Voyages anciens et modernes. No. 266 du Bibliophile français ; 88 p., 794 items. Paris (V), 62, rue des écoles, 1935.

ISIS

Quaritch, Bernard. A catalogue of books & periodicals on aeronautics, astronomy, chemistry, electricity, engineering, fortification and gunnery, horology, mathematics, meteorology, mining and minerals, navigation, physics, pyrotechnics, surveying, etc. No. 489, 74 p., 584 items. London, W.1, 11 Grafton St., New Bond St., 1935.

ISIS

Quaritch, Bernard. A catalogue of important & rare books on recent & fossil invertebrata (chiefly echinodermata), palaeontology & geology, including the library of the late FRANCIS A. BATHER. No. 504. 52 p. 770 items. London W.1, 11 Grafton St., New Bond St., 1935.

ISIS

Quaritch, Bernard. A selection of interesting books on a great variety of subjects. No. 500, 155 p., 500 items, 30 illus. London, W.1, 11 Grafton St., New Bond St., 1935.

ISIS

Sotheran, Henry. Annotated catalogue of works on mathematics, astronomy, and physics. No. 843. 160 p., 1899 items. London, W., 43, Piccadilly, 1935.

ISIS

Wepf, B. Der Basler Antiquarius, no. 54. 340 items. Basel, Eisen-gasse 5 (no date, received April 1935).

ISIS

IX. — 59. — MEMORIA TECHNICA

Isis no. 64 (vol. 22, 433-622, 7 pl., 20 p. facsimile). Bruges, Feb. 1935.

ISIS

This number is analyzed in the 44th Critical Bibliography. Every previous number has been analyzed in previous bibliographies. G. S.

Critical bibliography no. 44. *Isis*, vol. 24.

ISIS

This note is published at the end of our bibliography solely for the convenience of the scholars who cut out the whole or part of it, attach extracts to catalogue cards and classify them. By adding this note to the others they will be able to find out rapidly whether this particular bibliography has been analyzed or not.

60. — ERRATA. Series 34

(For previous errata see *Isis*, 24, 294)

Si quis Argi oculos habere posset eosque omnes diligentissime ac accuratissime intenderet in singulos versus, multa tamen eum inter corrigendum effugerent. JOANNES MATTHAEUS (Wittenberg, 1619).

Isis 19, 201. First paragraph of my review. I stated in my *Introd.* (I, 628) that the Arabic text of AL-FĀRĀBĪ's *De ortu scientiarum* was lost. That statement is correct. For the *Iḥṣā' al-'ulūm* is a different text (*De scientiis*). G. S.

Isis 22, 440. End of footnote 1931, not 1932.

Isis 22, 558. Title Vth century, add. B.C.

Isis 23, 534, l. 11. HOWARTH, O.J.R, instead of HOWARTH, C.J.R.

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their set of *Isis* and the *Introduction*. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note to indicate that these and the previous errata have been taken into account. G. S.

These and the previous errata have been corrected by.....

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The Roman figures followed by (1) or (2) refer to the centurial classification (Part I); Thus, Cohen, H. XVI(2)C means that a paper by Cohen is listed under sixteenth century, second half, subdivision C.

The Arabic figures refer to the historical and to the systematic classification (Parts II and III) which are subdivided in sections numbered consecutively from 1 to 60. For instance, Bailey, T. G., 9, indicates that a paper by Bailey is listed in section 9 (India); Bliss, H. E., 18, indicates that a paper by Bliss is listed in section 18 (Philosophy of science).

June 1935.

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